

**YIYI
GAO**

COLUMBIA GSAPP
M.ARCH
PORTFOLIO

2020-2023



01-06	CORE STUDIO I	-----	THE WOVEN STREET
07-10	CORE STUDIO II	-----	THE NEW PS.64
11-12	ADR II	-----	DEAR DATA
13-21	CORE STUDIO III	-----	THE BRONX VERTEBRA
22-29	ADVANCED STUDIO IV	-----	IDLEWILD
30-31	AT V	-----	CURTAIN WALL BUILDING MANUAL
32-33	X INFO MODELING	-----	ESSENTIAL TRIPS
34-41	ADVANCED STUDIO V	-----	THE WORD FOR WORLD IS FOREST
42-43	VIRTUAL ARCHITECTURE	-----	INFINITY ROOM
44-51	ADVANCED STUDIO VI	-----	POSTSPORTSPLAZ REIMAGINED

THE WOVEN STREET

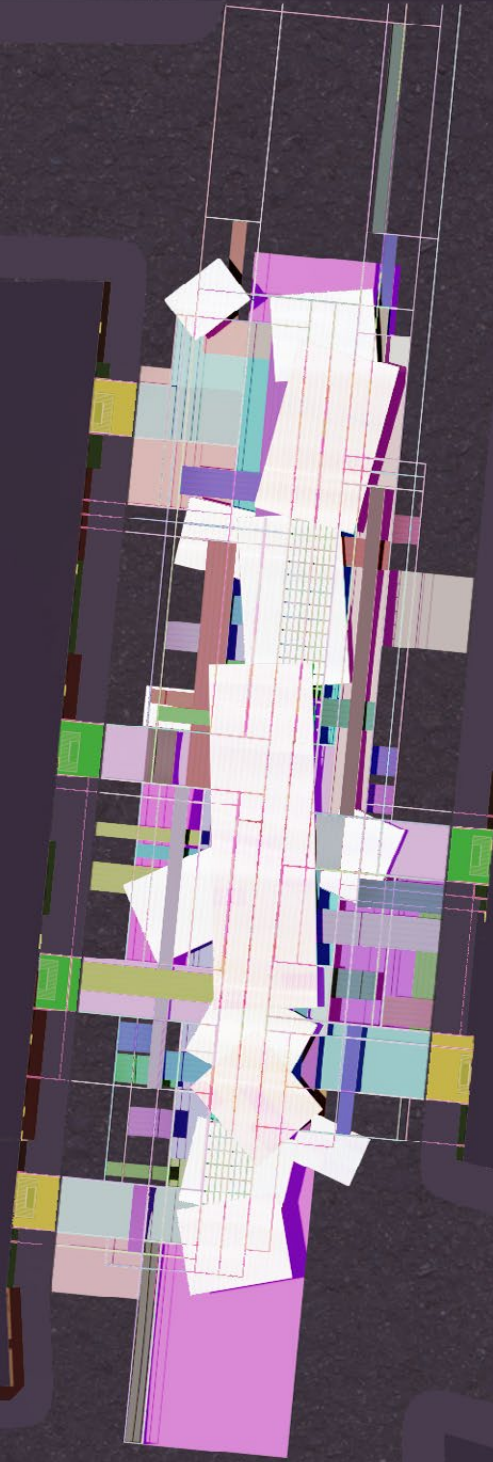
URBAN INTERVENTION

STUDIO CRITIC: Jerome Haferd
SEP - DEC 2020

"Washington Heights - referred to as the Little Dominican Republic - holds the potential for completely other urbanism: one of 'inverted' values, expectations, and spatiality to that of the late-capitalist, hegemonically White, metropolis."

New commercial spaces never stop expanding, pushing the informal economies to the periphery. Within these economic orders, the bodegas are corner shops owned by marginalized immigrants, and the street vendors have been constructed to seize small spaces along the sidewalks. How can the hierarchy of these spatial and economic systems be reimaged?





This bottom-up system start with a frame. Woven fabric began to constitute walls. As the frames connect with each other, a space is created. As spaces connect, a system is created.

Each system is a layer, added to the intervention similarly to pasting advertisements on the street --- layer by layer, piece by piece, covering, dividing, and modifying the current spatial structure of the street.



Inspired by the clotheslines stretching from the tenement houses as a type of informal space making. The spontaneous activities blurred the boundary between the public and the private.

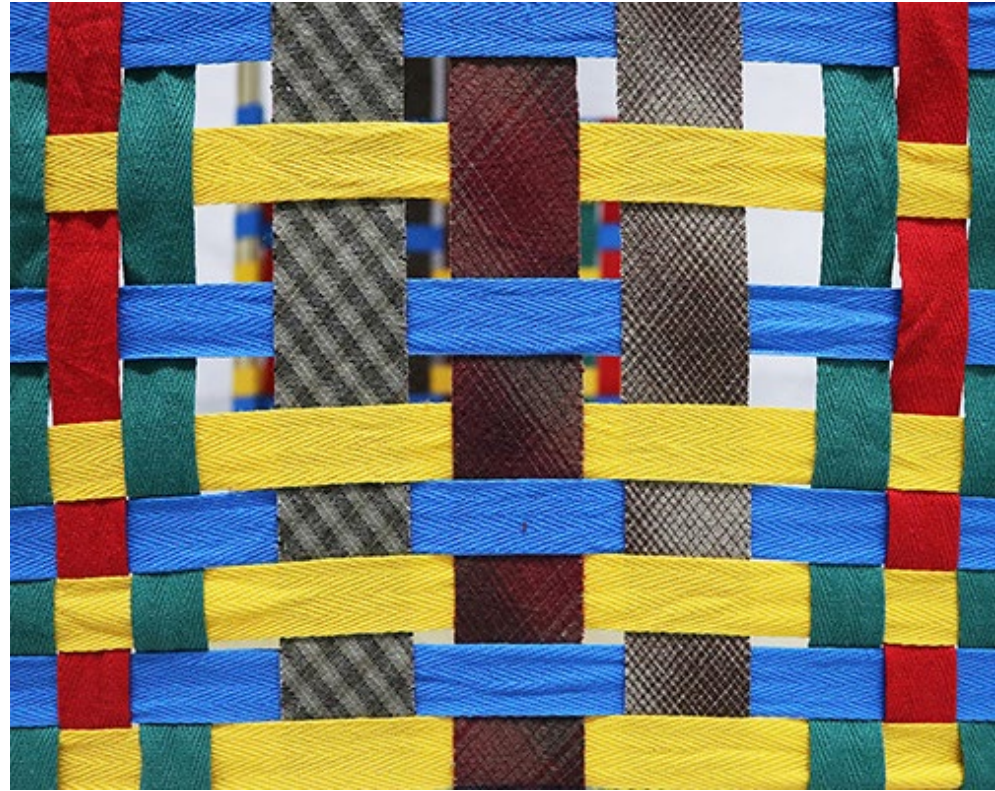




Advertisements used by bodegas, food carts, and street vending.



4 WEAVE



5 TRANSFORM

CORE STUDIO I | THE WOVEN STREET

The street transforms as each layer and system overlap. The result is a space with increasing disorder within the coordinated layers.

The civic space can be used for trading, performance, gathering, and all kinds of activities envisioned. The top platform is for installation, cleaning, and maintenance.

The Manhattan Grid that dominated the urban landscape and socio-economic structures can be broken down. New design systems emerge, softening, and eventually, dissolve the grid.



THE NEW PS.64

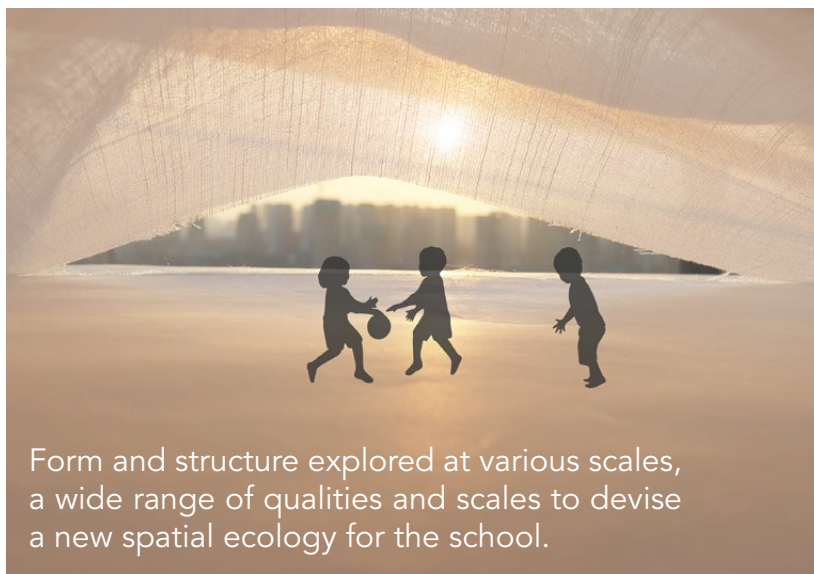
SCHOOL
STUDIO CRITIC: Benjamin Cadena
JAN - APR 2021

Originally designed by Charles B. J. Snyder and served as a public school from 1907 to 1977, Public School 64 (PS 64) has been abandoned for years. Retaining its primary role as a public school, the adaptive reuse establishes on the physiological and emotional obstructions students may encounter.

From individualized and permeable learning zones, tactile way-finding systems, to netted playground for active exploration, the design aims to create an accessible environment where differently enabled students as well as the larger community can learn and explore through diverse sensory experiences.



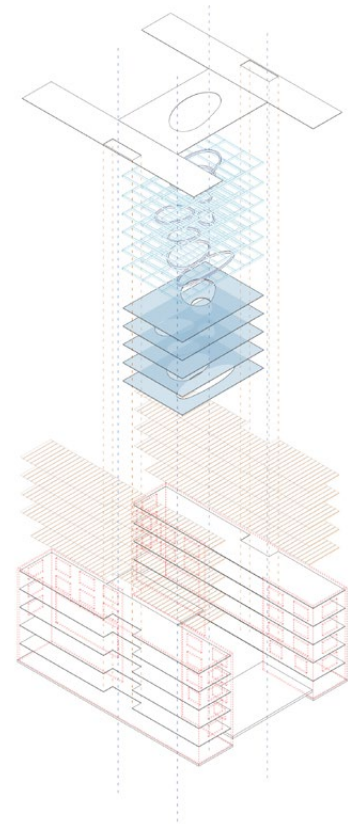
1 HARD, SOFT



Form and structure explored at various scales, a wide range of qualities and scales to devise a new spatial ecology for the school.



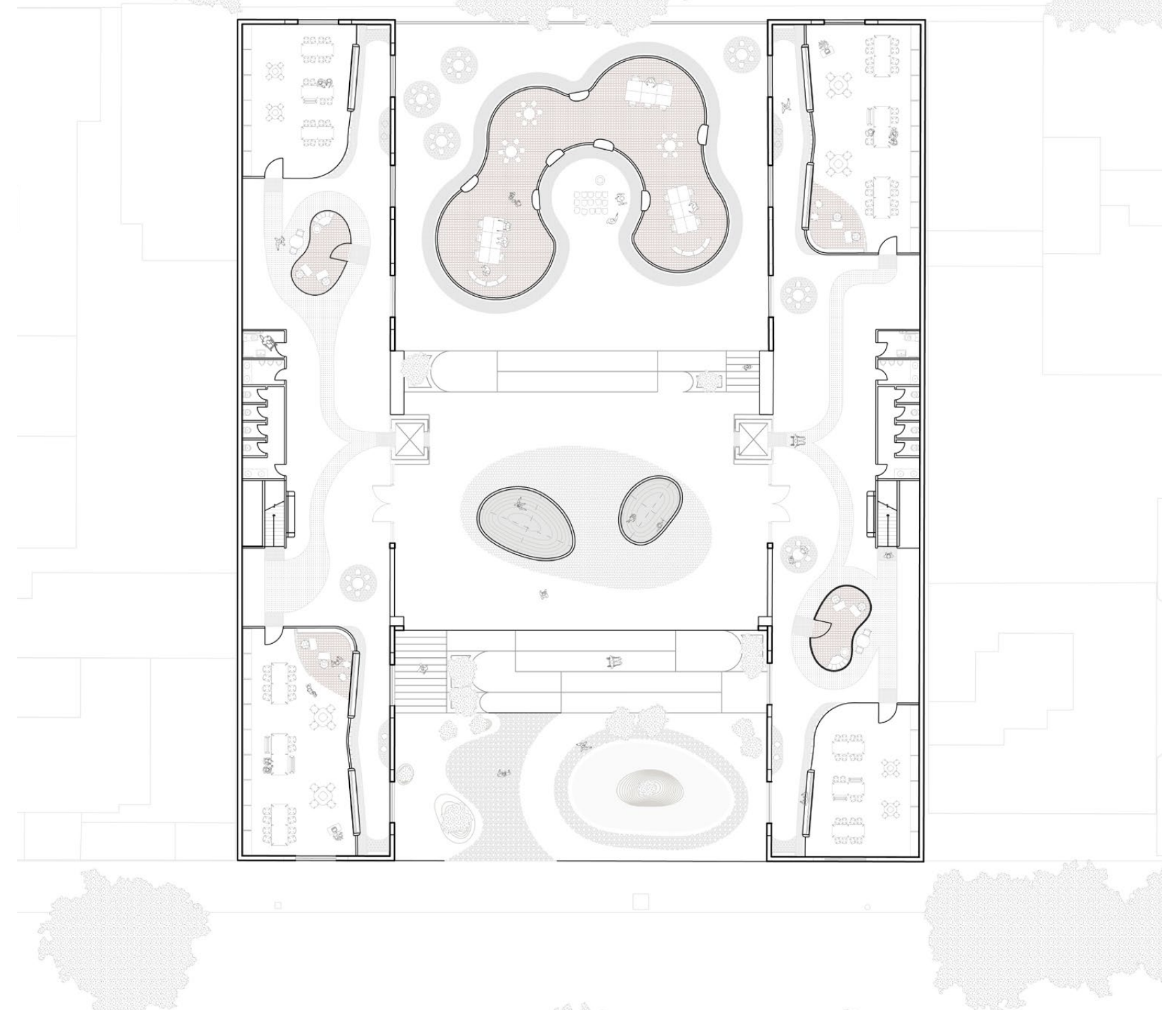
The middle part of the "H-plan" will be replaced with a new "soft" building.

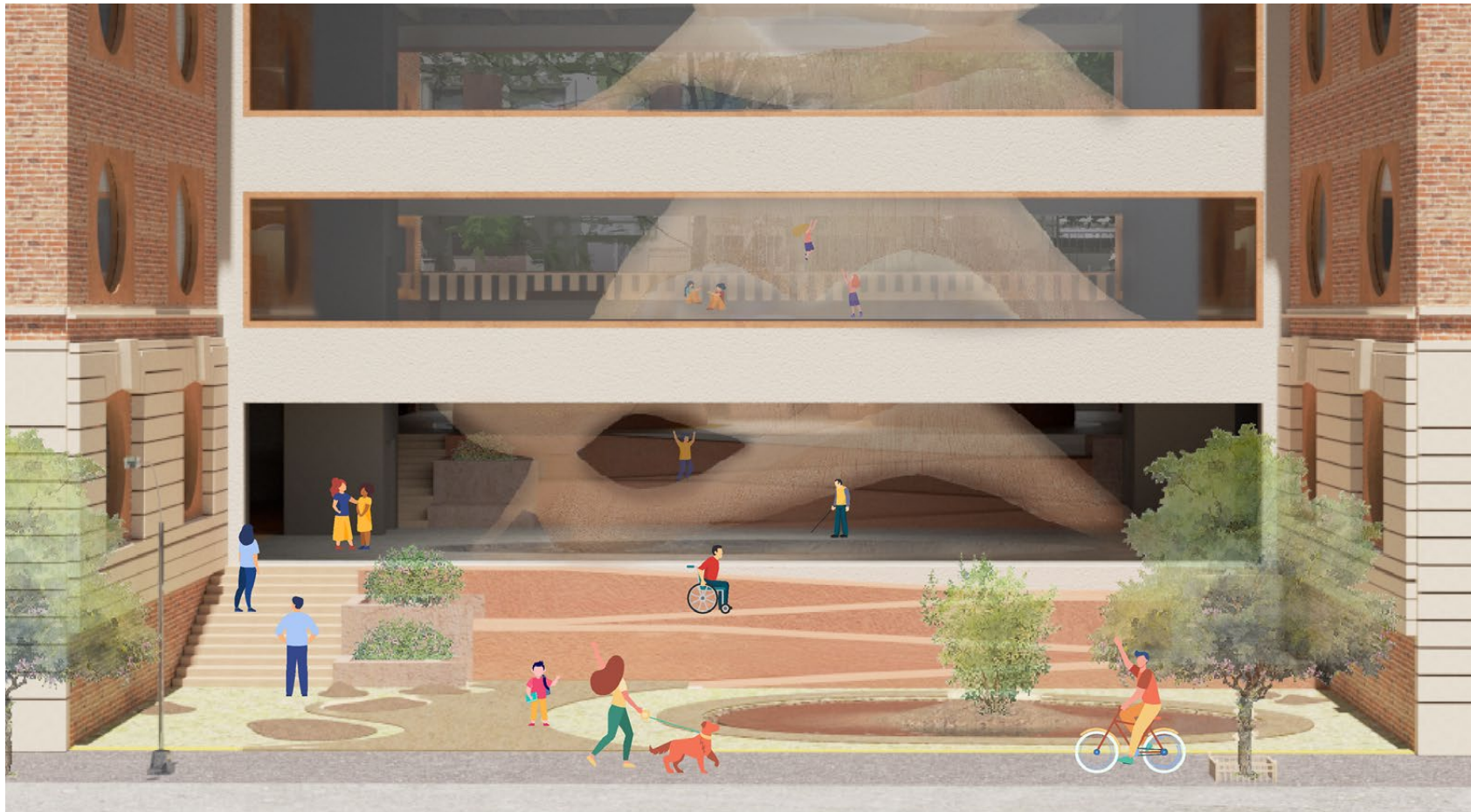


2 LEARN, PLAY

To reuse PS. 64 as a public school, the design approach is to reconsider physiological and emotional obstructions students may encounter, and create an accessible environment where students can learn and explore through diverse sensory experiences.

Two wings of the original "H" plan with load-bearing masonry walls are preserved for school classrooms. A new, "soft" building is inserted into the middle for shared programs.





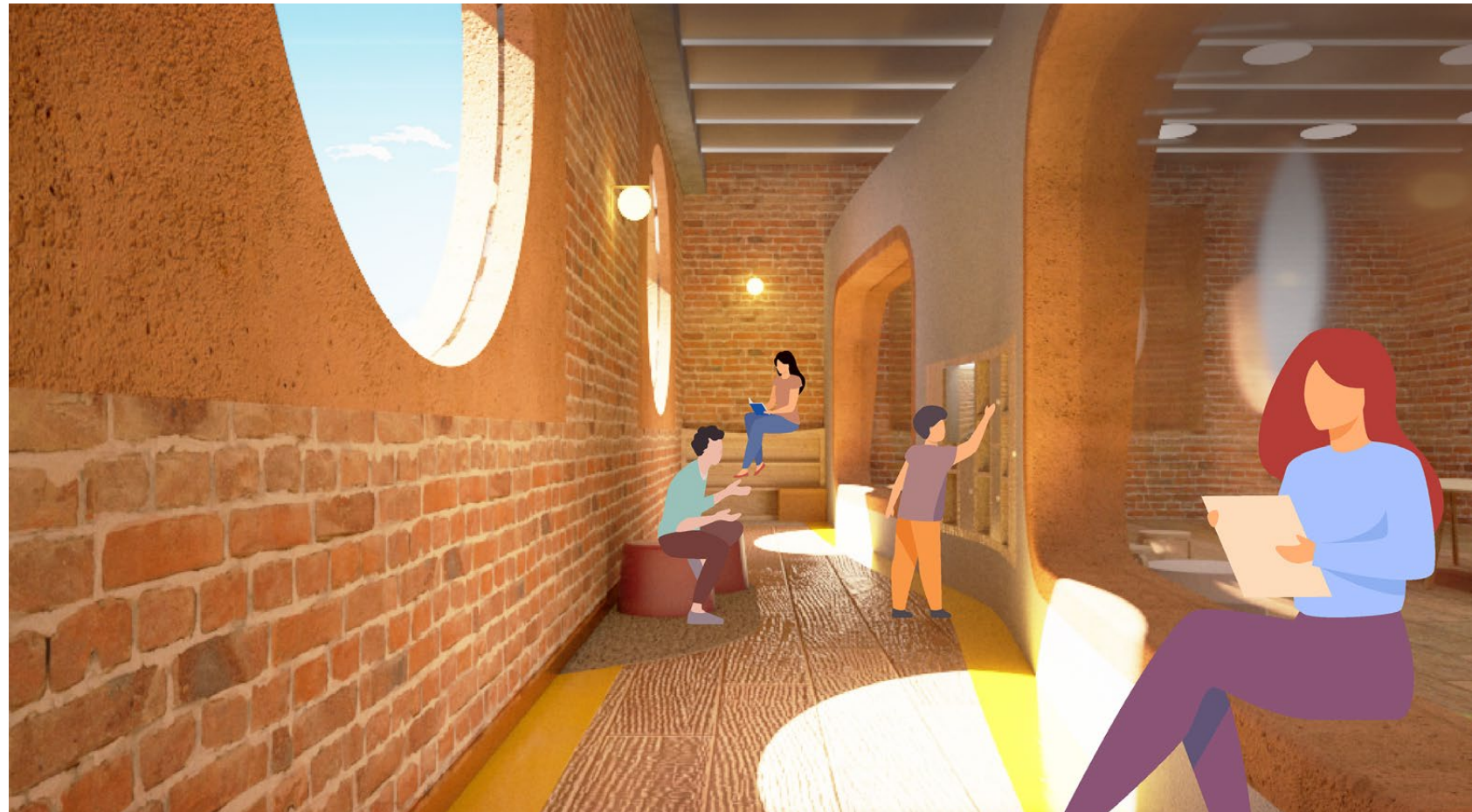
SCHOOL ENTRANCE

As people enter the school, different programs are indicated by road surfaces for both tactile and acoustic way-finding and spatial orientation within the school.



RESOURCE ROOM

A public resource room providing private zones for specialized instruction, assistance with homework, therapy, and other tools.



CORRIDOR

The outside of the classroom are marked with changes of material for identifying change of space. These small moments on the floor might not be noticeable for those who can see but can be easily picked up by those can't see, even in a loud school environment.



CO-TEACHING CLASSROOM

There are special education zone within a general classrooms. Tactile panels and perforated boards can be attached to the interior wall and the floor to display Braille language signs and objects needed for students to learn about shape and materiality.

DEAR DATA

IN COLLABORATION WITH:
Carley Pasqualotto

COURSE CRITIC: LORENZO VILLAGGI
JAN - APR 2021

PRODUCTIVITY(%)

----- SAMPLE A

----- SAMPLE B

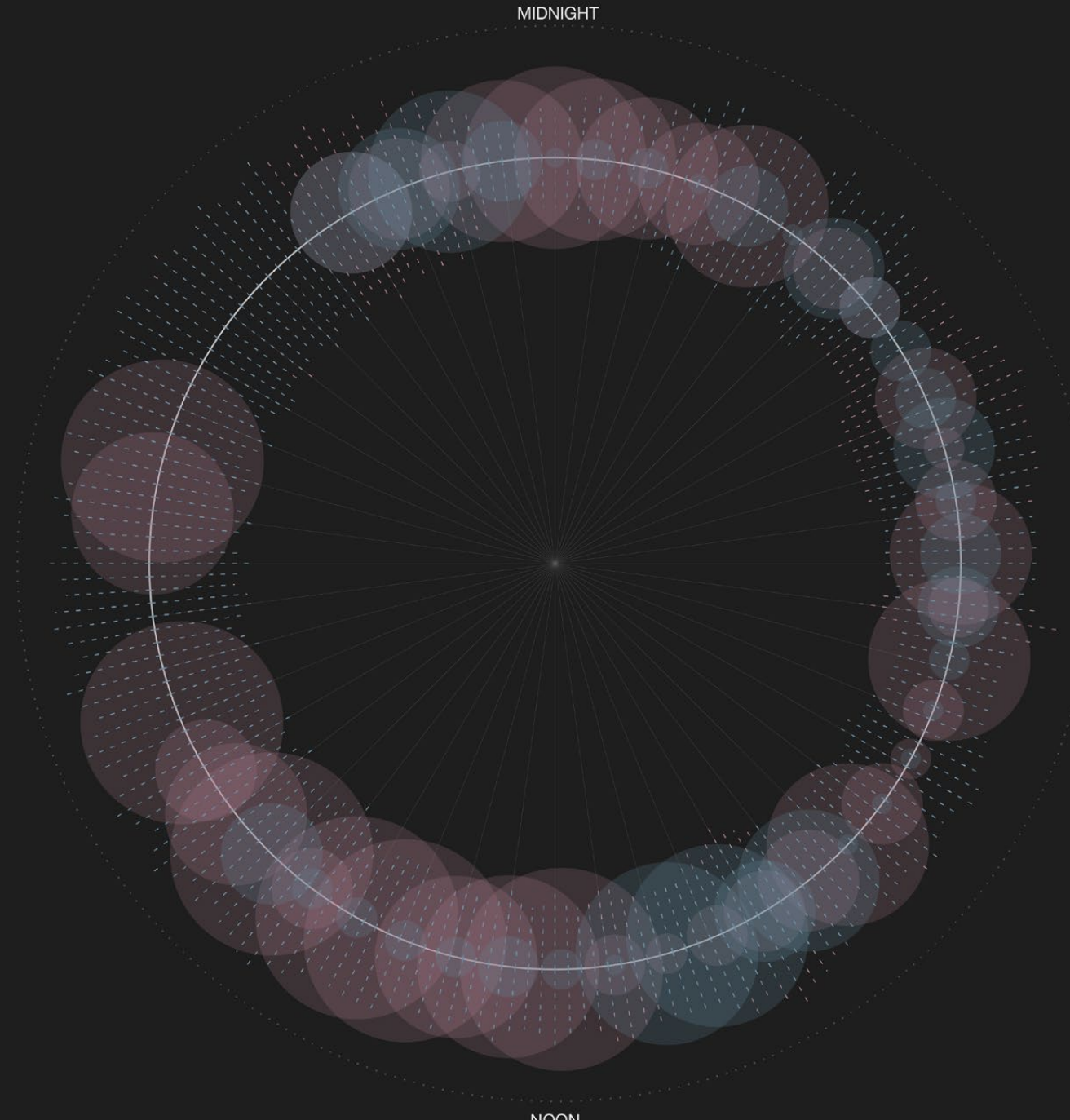
DISTRACTION(%)

● SAMPLE A

● SAMPLE B

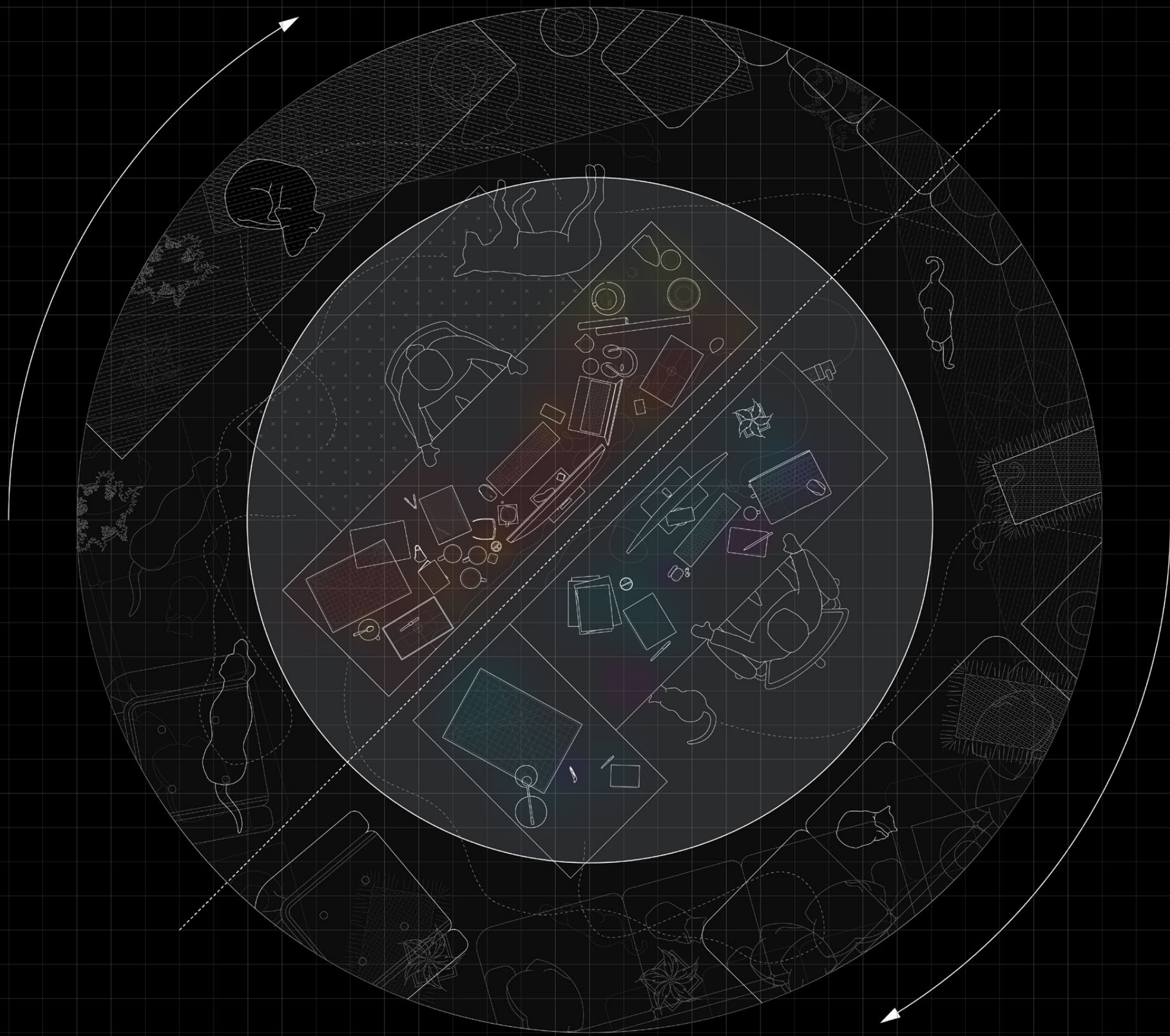
TYPES OF DISTRACTION

- SOCIAL MEDIA
- NOTIFICATION
- SCHOOL WORK
- OTHER WORK
- SOCIAL LIFE
- OTHERS



CATEGORIES OF DAILY ACTIVITIES

SCHOOL WORK	ZOOM CLASS	SOCIAL TIME	PHYSIOLOGICAL NEEDS	RUNNING ERRANDS	OTHER WORK



BRONX VERTEBRA

HOUSING
IN COLLABORATION WITH:
Maxine Gao

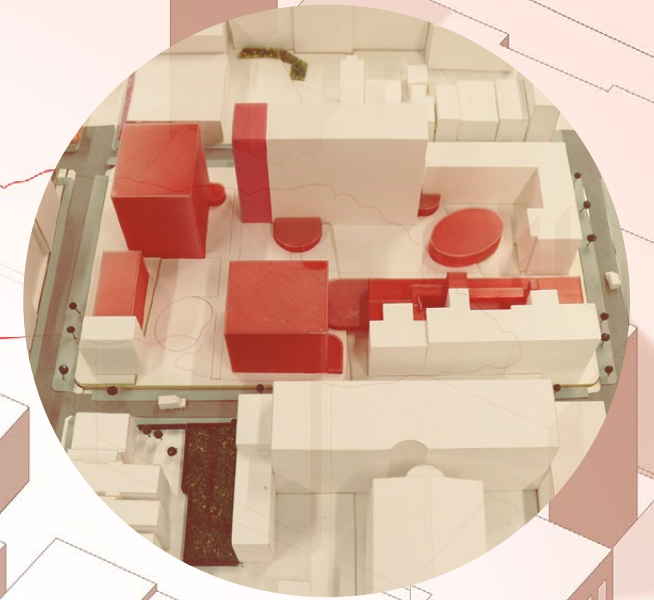
STUDIO CRITIC: Esteban de Backer
SEP - DEC 2021

BronxVertebra responds to the missing role of public service in the Bronx and becomes an opportunity to reassess the fundamental living modules. There is a need for intermediate conditions between the public and private: from households to the neighborhood, from dwellings to the community, and from the community to the city.

How to calibrate the various levels of privacy and connectedness? At the scale of each residential building, the Vertebra is a network of sharable amenity services and collective spaces in between units. On the street level, a central spine inside the block ties the community programs, forming a system of flexible, intermediate zones. The Vertebra bridges the residents with public services and, on an adjustable scale, connects the residential community to the larger city.



1 INTERVENTION



- NEW CONSTRUCTION
- EXISTING BUILDING

The Bronx suffers from NYC health and educational resource disparity. Zooming into Melrose, we identified four major types of public services missing from the neighborhood: primary care, food services, day care and open playground.

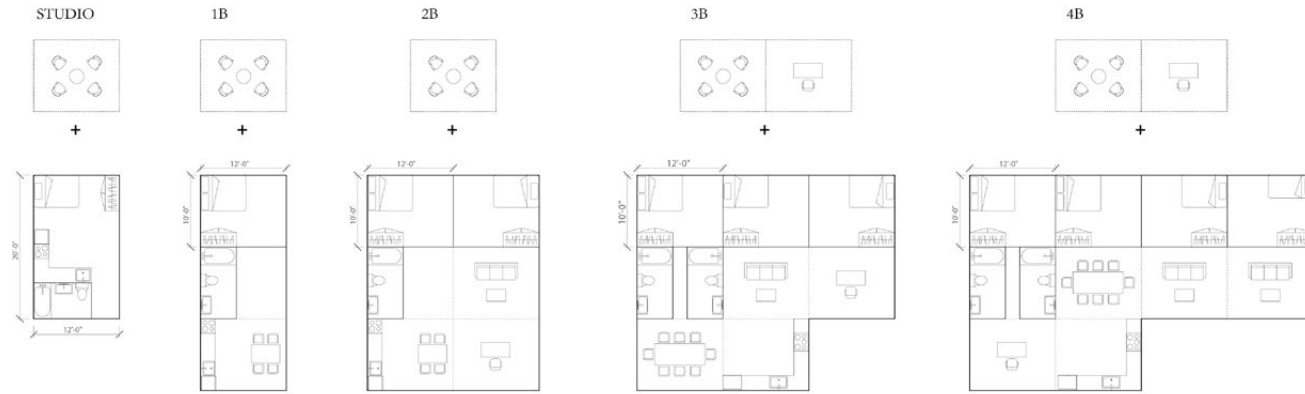
There is a new inner streetscape with residential amenity and community programs on its sides. This is the Bronx Vertebra, a central spine providing public services to the community.

On the east 151st street side, there is an open access next to Bronx Documentary Center, emphasizing a connection to the existing community garden across the street, which all hold important values for the community.

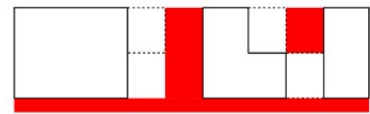
2 UNIT

Defining the minimal living module to accommodate daily activities as 12*10

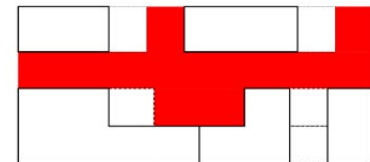
All the units are made up with the basic modules



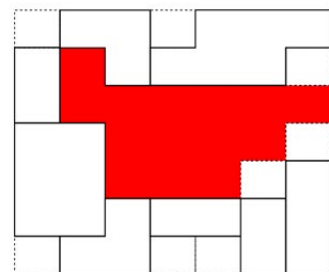
3 AGGREGATION



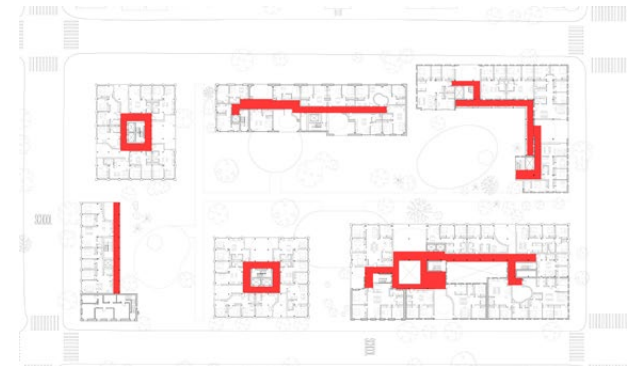
Aggregation 1:
Single loaded corridor with collective spaces scattered around



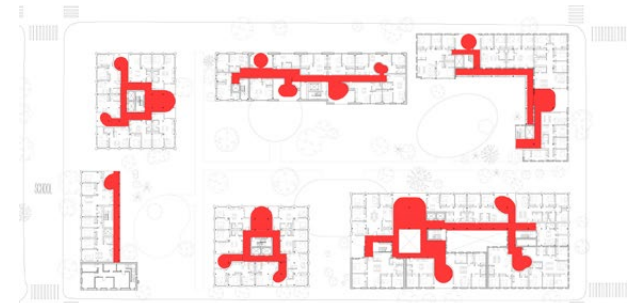
Aggregation 2:
Double loaded corridor with collective space on both sides, corridor starts to expand and integrate with the spaces



Aggregation 3:
Pin tower with radial plan, units clustered around a central core



Corridor

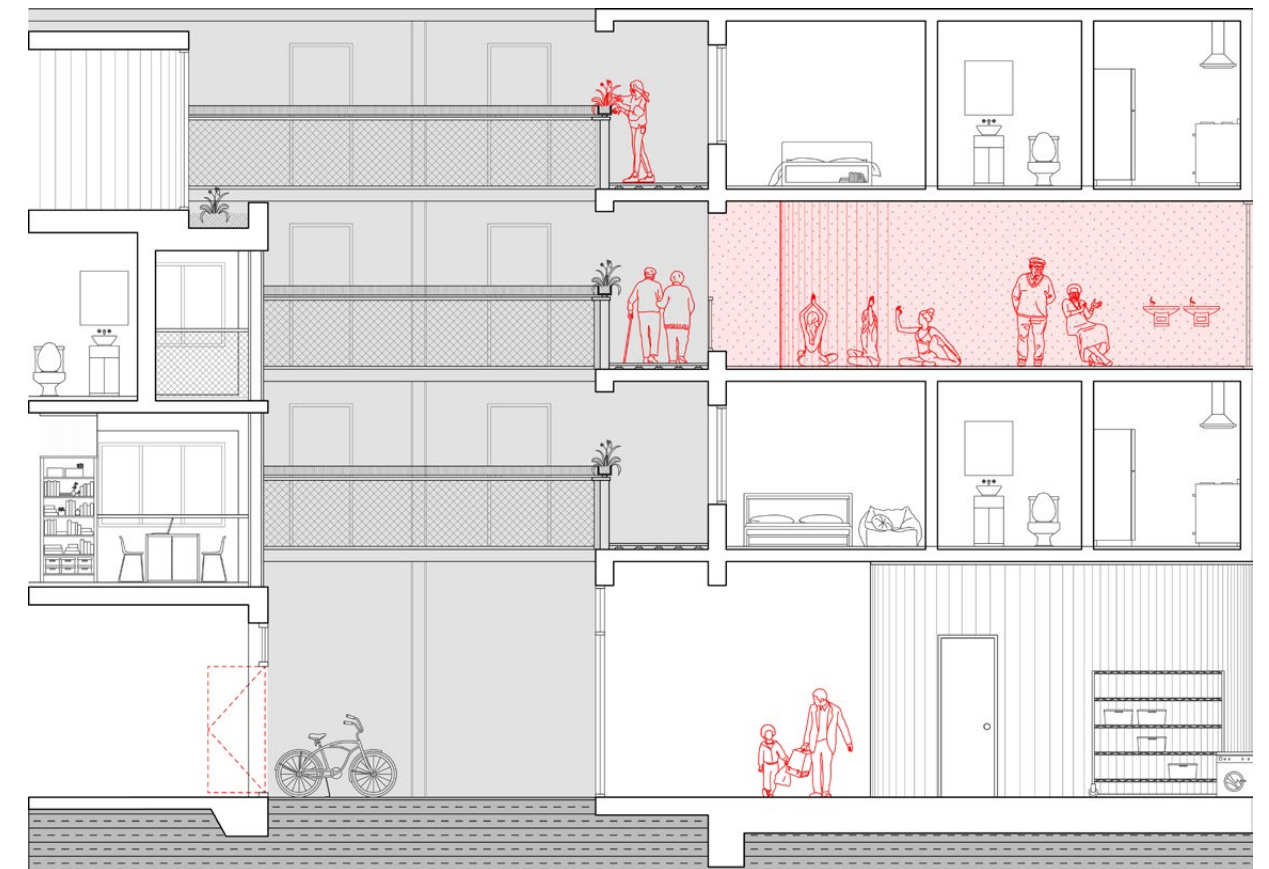
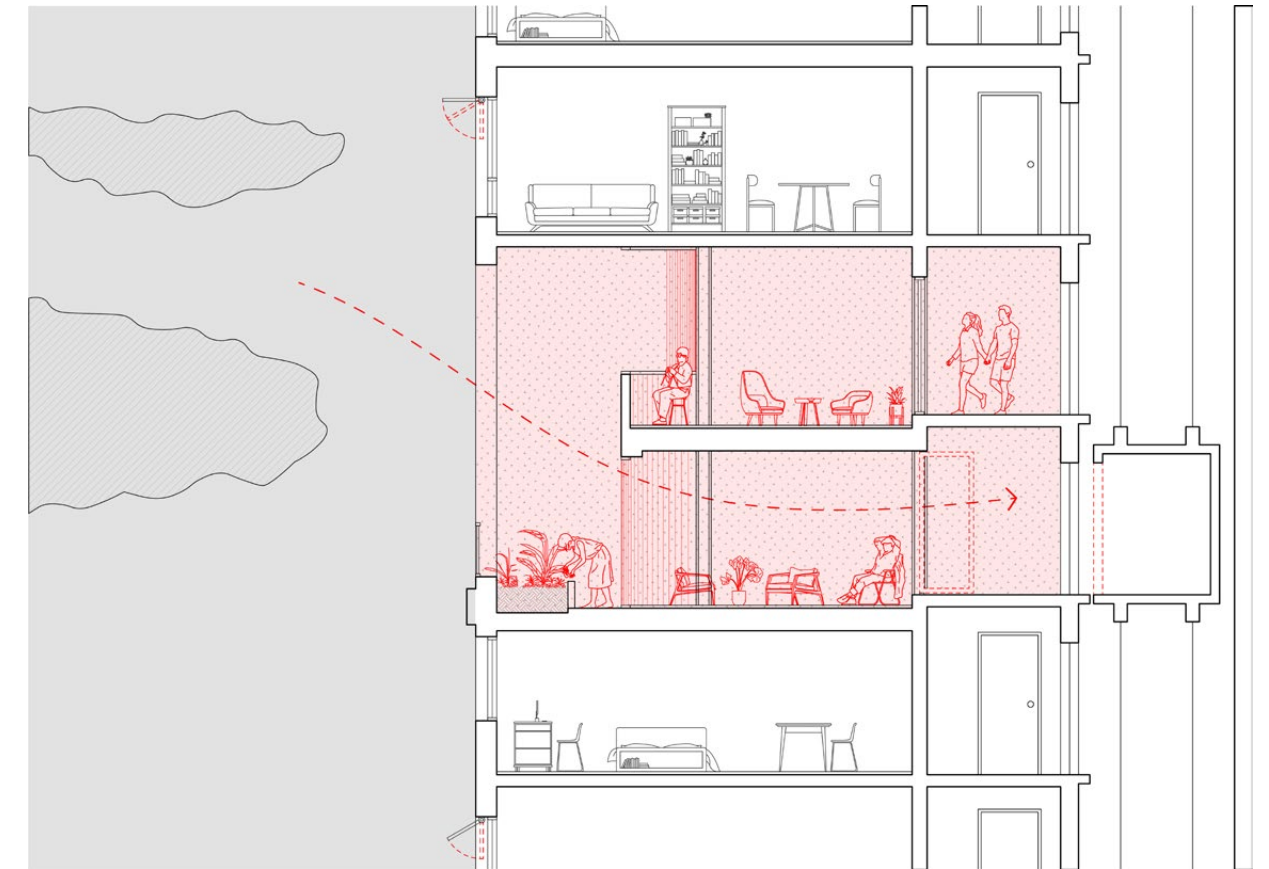


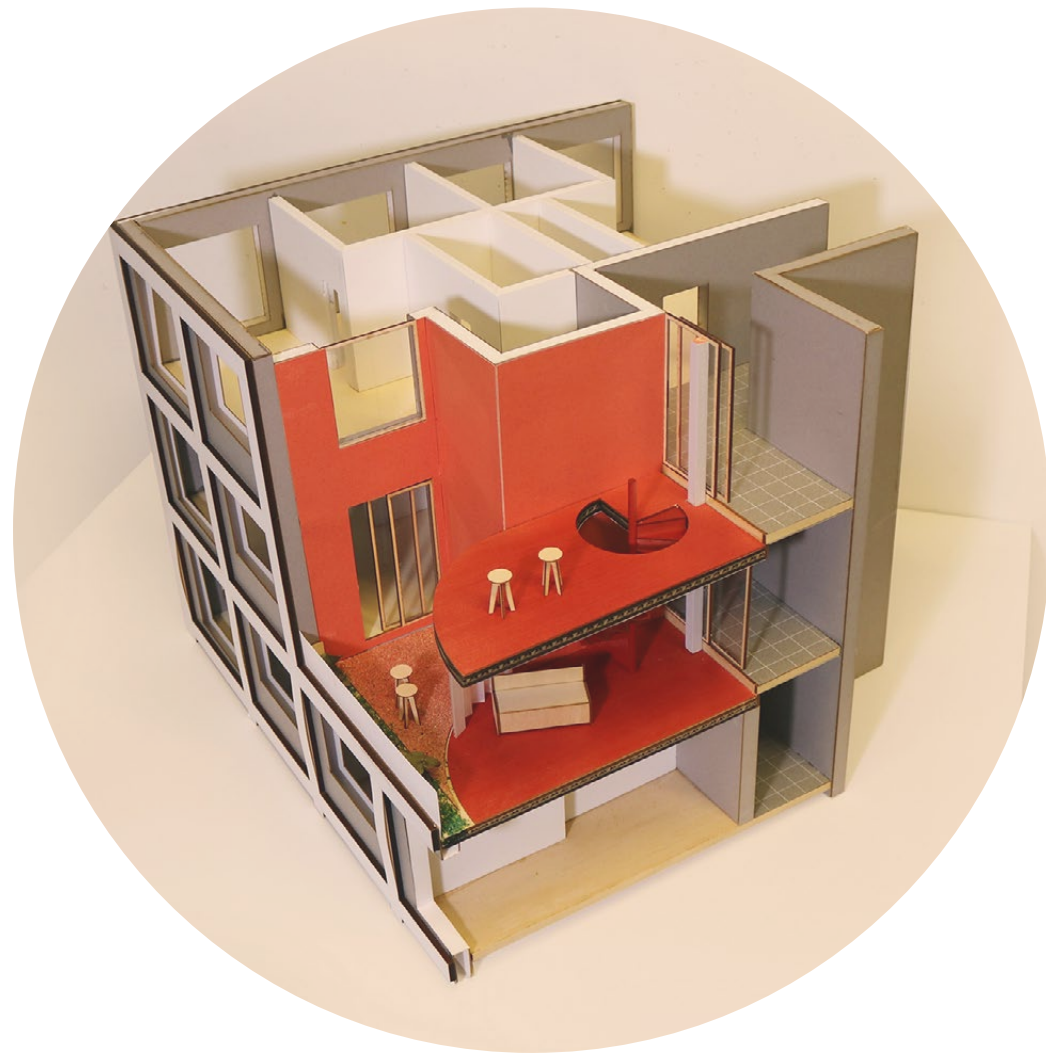
with Interior Collective Space



with Exterior Collective Space

4 INTERMEDIATE



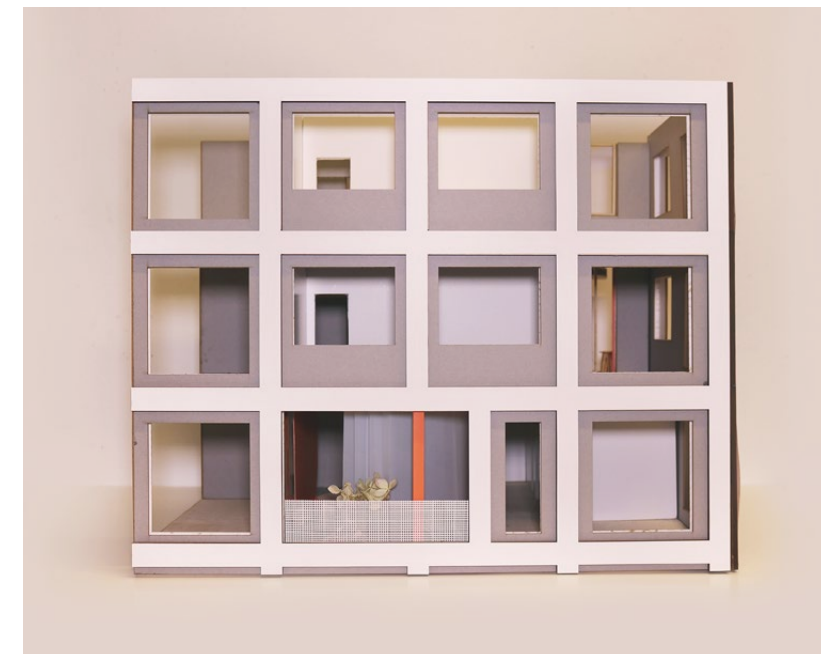


Double enclosure system controls the exposure to the outside and levels of privacy - the flexibility and openness of the system allows for natural ventilation and sunlight.

Thicker floor slab for shared programs with higher occupancy load and to suit different programmatic use, such as growing plants.

This system of creating collective areas as the intermediate space for private/public and indoor/outdoor is achieved by the two layers of enclosure: outer layer being polycarbonate shutter door and inner layer being the folding door, both can be fully opened and closed.

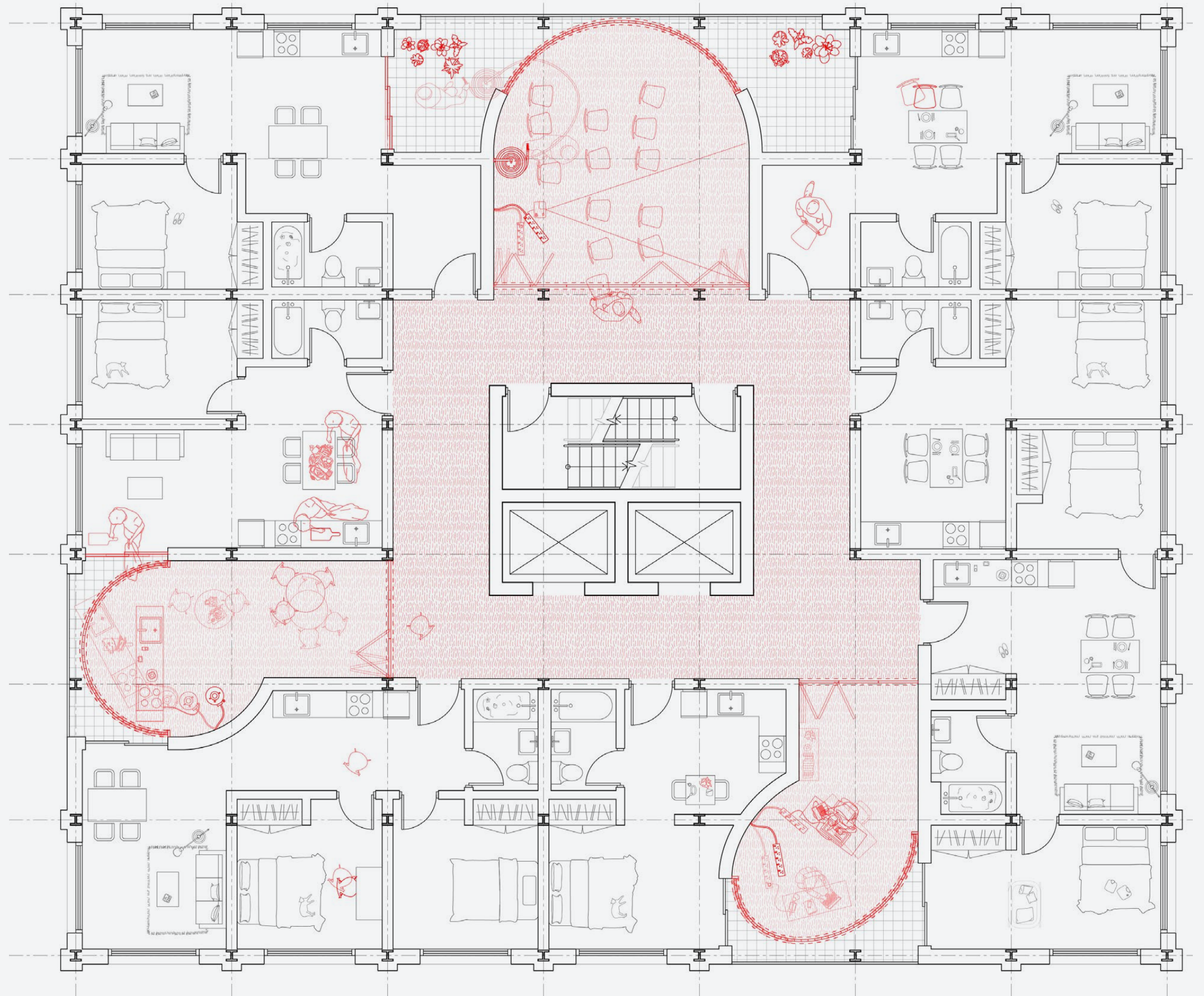
By operating the double skin system, residents control the level of sharing.



6 RESIDENTIAL



The intermediate spaces changes the harsh boundary between private units and the collective space.

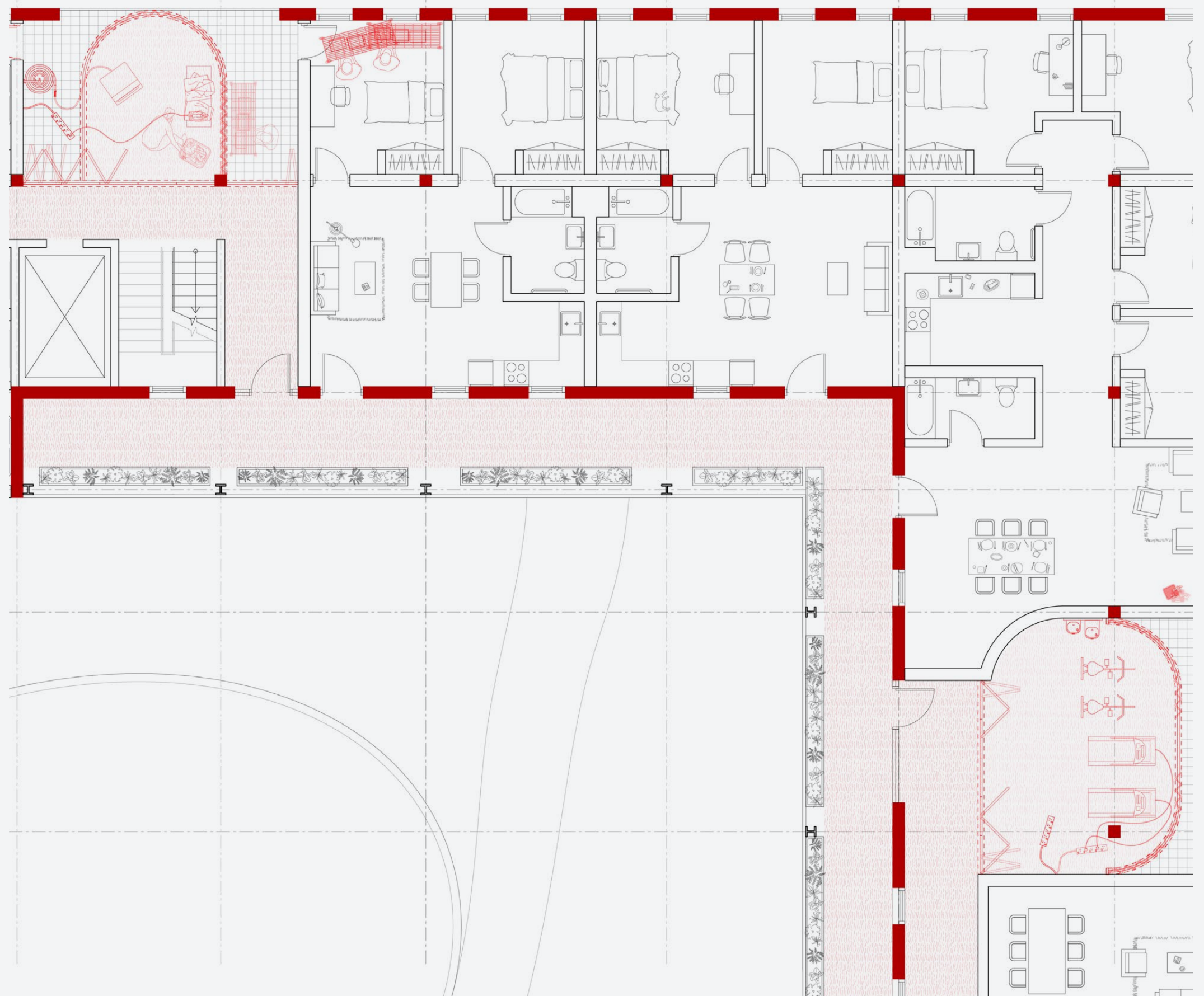


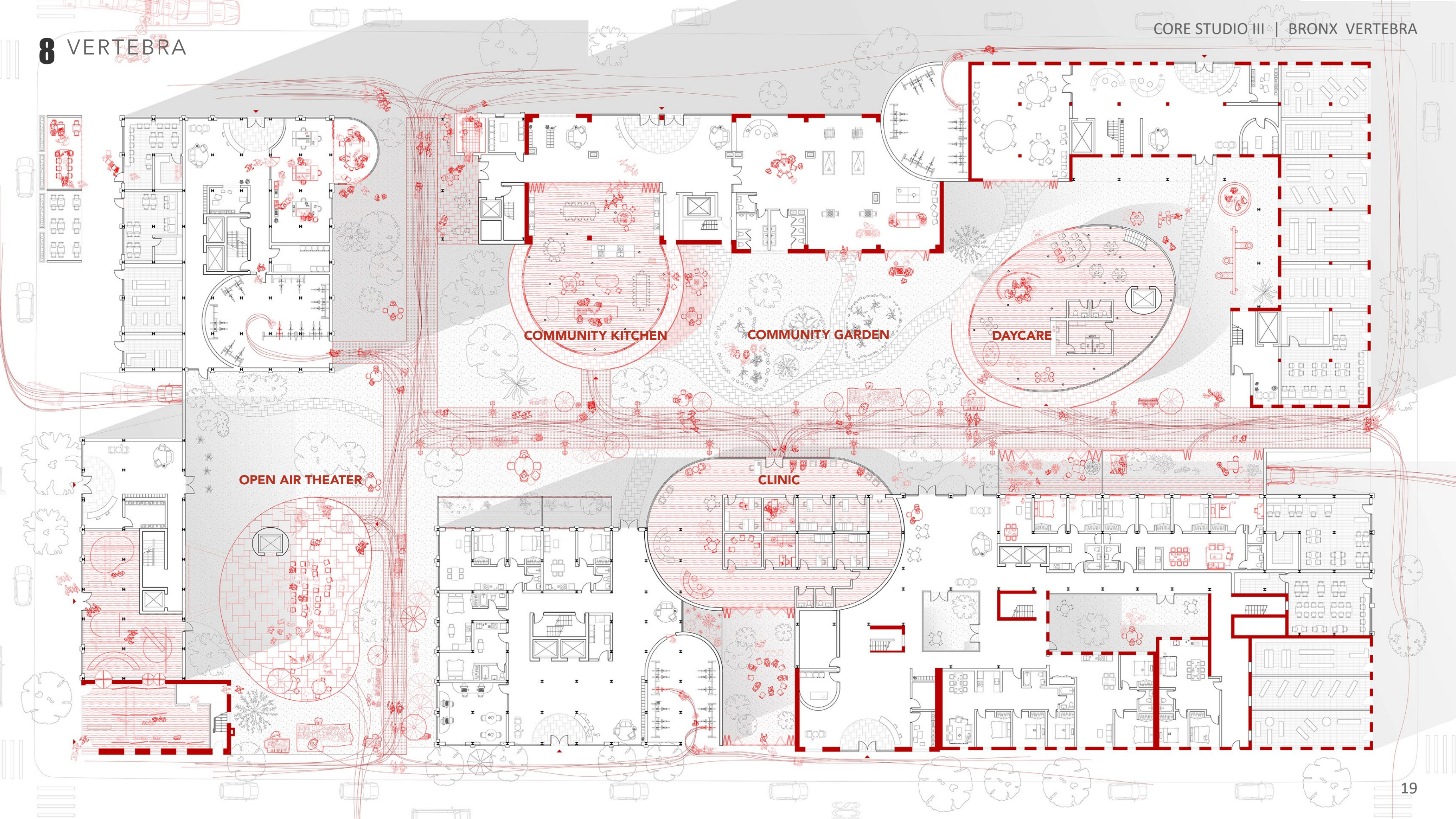
7 COLLECTIVE



COLLECTIVE POCKET

The intermediate spaces also changes the relationship between housing and public program. For example, the collective pockets on residential buildings allow visual access to the daycare center, forming a stronger and safer neighborhood bond.



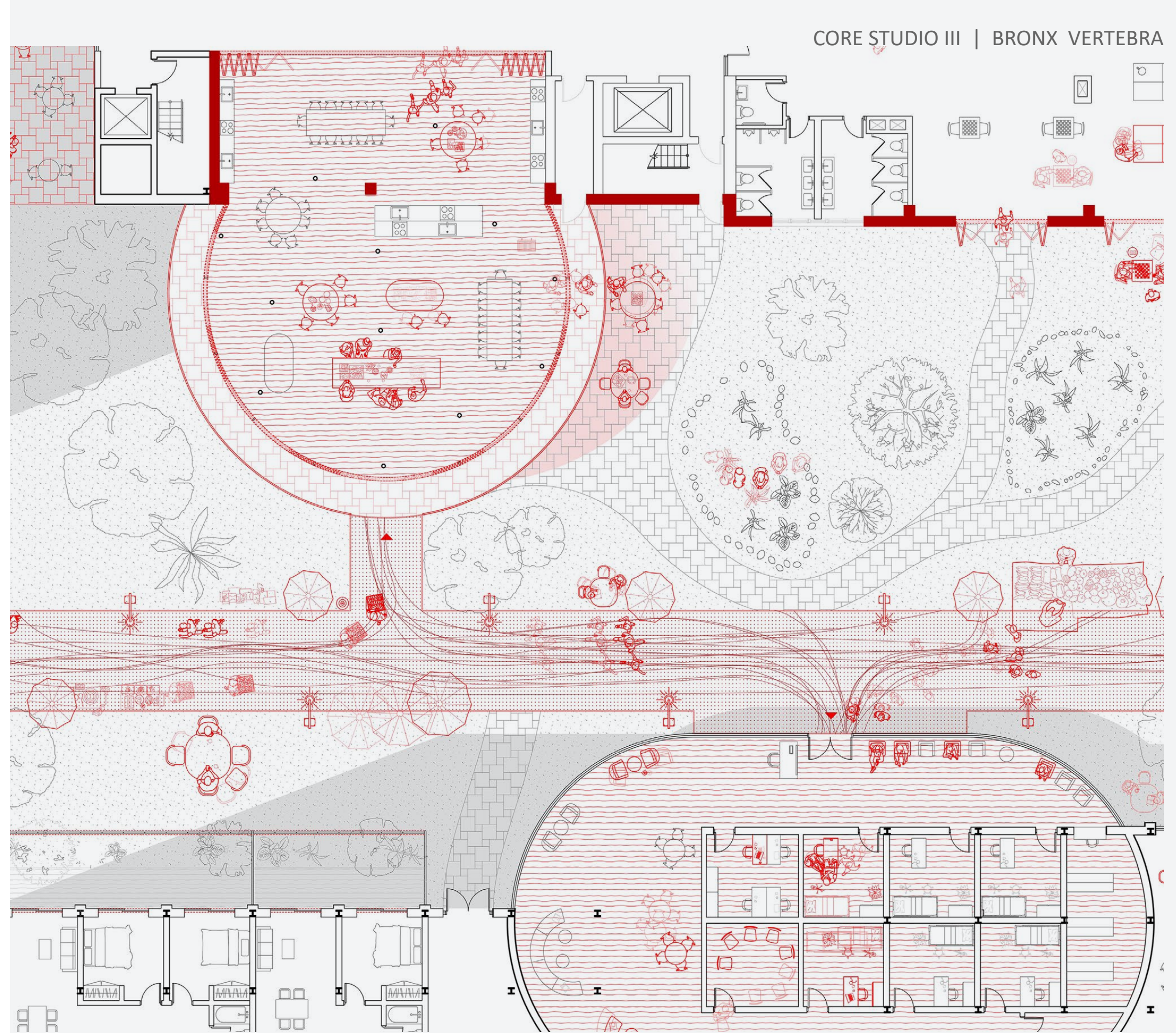


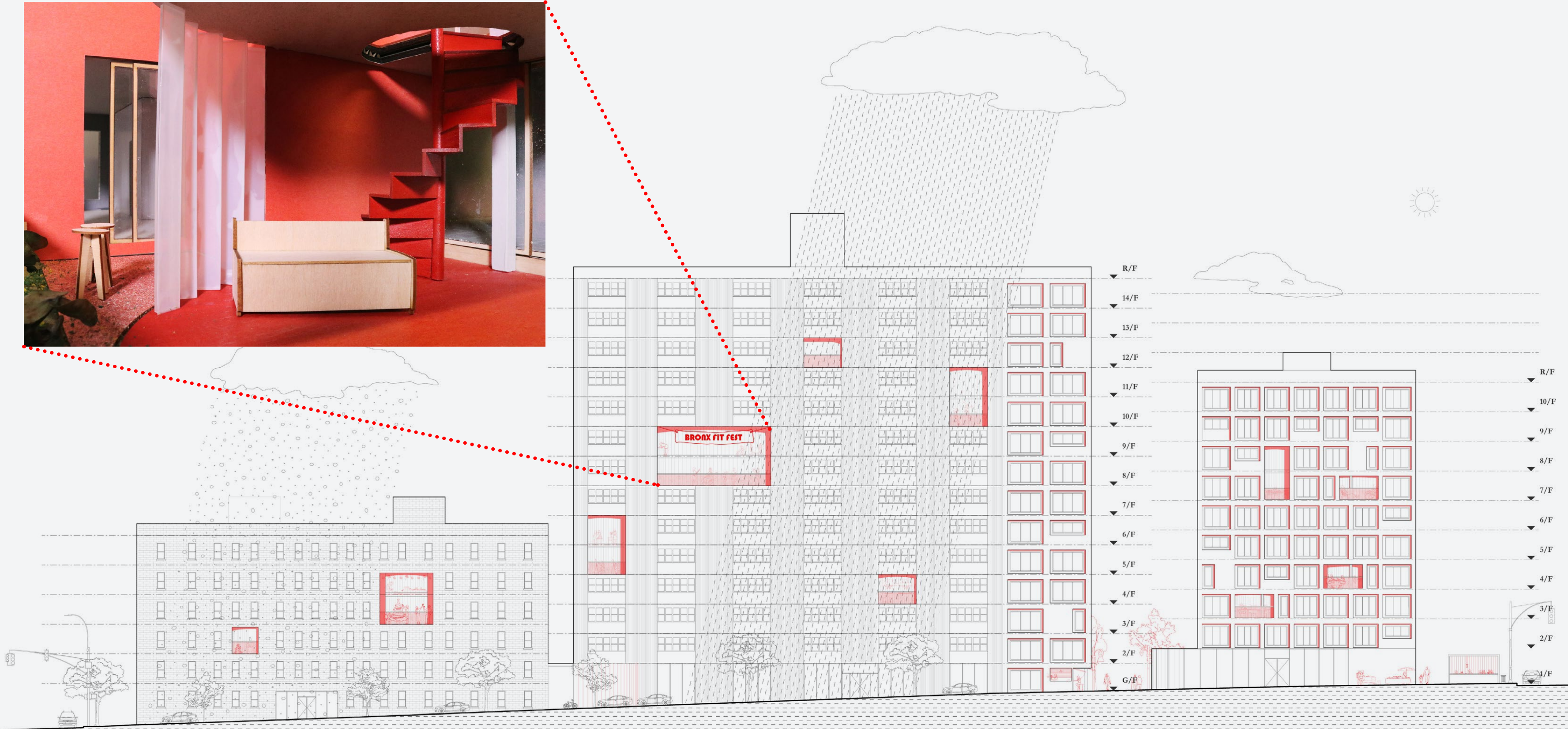
9 COMMUNITY



The intermediate spaces between units and the city are identified by white mesh and flexible polycarbonate enclosures for both the interior and exterior.

After coming home from work and school, and the collective programs can be filled with all kinds of activities and become eyes on the street; for people passing the street outside the blocks, these pockets from the elevation would add more interesting moments to the city.





IDLEWILD

MASS TIMBER FACTORY
STUDIO CRITIC: Lindsey Wikstrom
FEB - APR 2022

"This little domain lay upon a shelf or terrace on the western bank of the Hudson, at the point where its waters received the slender tribute of Moodna Creek. The location seemed destined by nature for a gentleman's country seat, from its variety of surface and its noble timber."

----- Outdoors at Idlewild

The summer-house is part of the romanticized journey of people retreating into the forests along the Hudson River. Missing from these imaginaries is the movement of labor. Today, the summerhouse Idlewild no longer exists, and the landscape remains the same. The new Idlewild, with its variety of surfaces and new types of timber products, re-distributes the function of summer houses as healing places to a dangerous and labor-intensive workplace. As a worker-owned mass timber manufacturing facility, the new Idlewild is a manmade landscape of mass timber inside the natural landscape, designed to introduce new modes of working and relaxing for people in the forestry and lumber production industries.



1 THE FLOW



For centuries, people retreat into the forests along the Hudson river. The journey upriver is part of the Hudson River School bourgeois romanticism depicting the American landscape.

Missing from these narratives, are the movement of labor down the river, the stories of logging and hauling. People in the Hudson Valley have a long history of the lumber industry, but the history of the forests as a healing place was exclusive to those who could afford the forest.

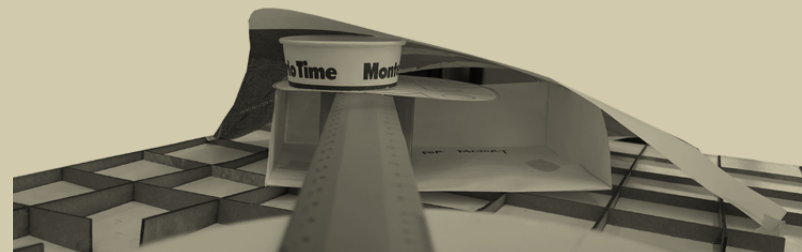
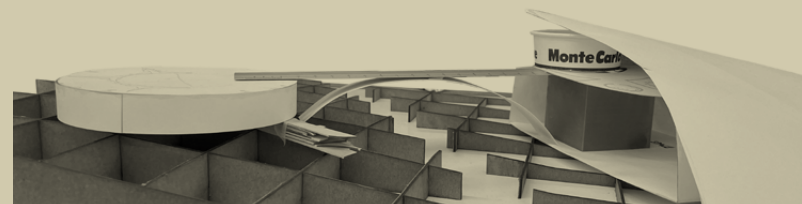
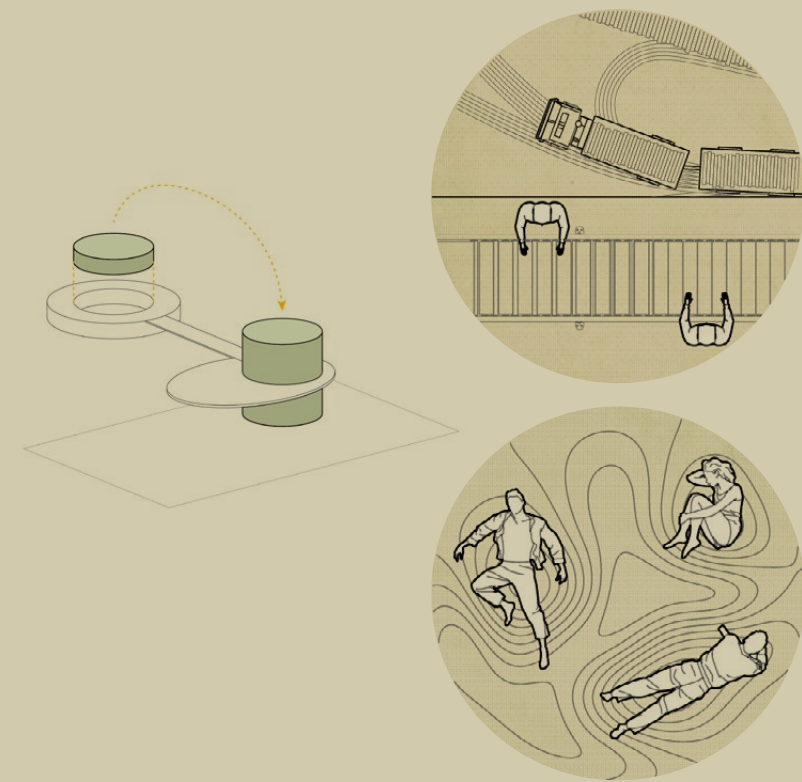
Journalist Nathaniel Parker Willis purchased land at Cornwall on Hudson and named it Idlewild. This summer house became well-known to New Yorkers through the extensive publication of his book, *Out-Doors at Idlewild*.

The land near the old Idlewild today is near the riverbank, with abundant vacant land for a new mass timber factory. What does it mean for the village of Cornwall on Hudson to have a new workers owned factory, attracting a more diverse group coming to the village? How long will they stay? Where do they live, and what products do they make?

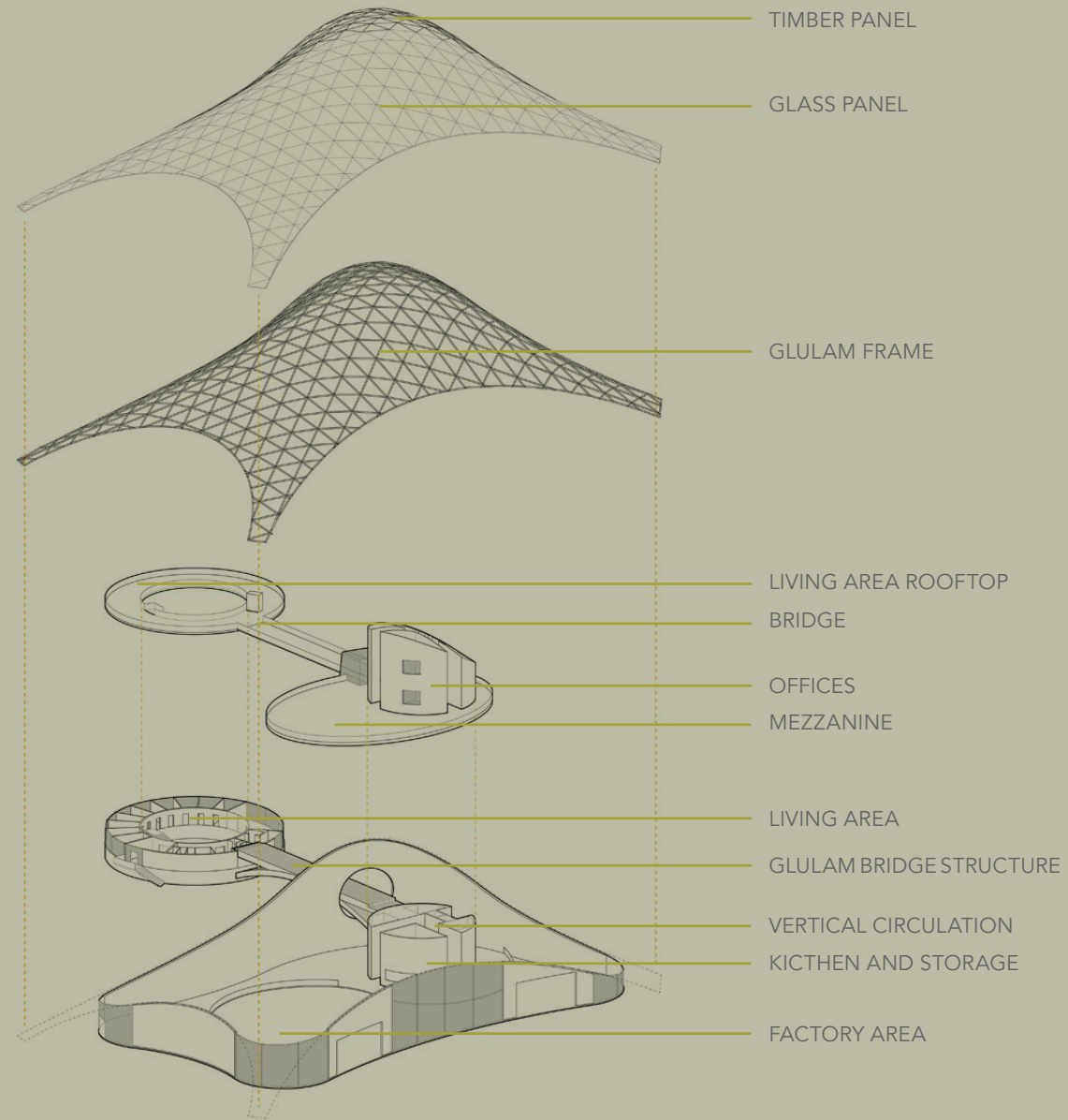
2 THE TWO HILLS

The two zones are two hills of a mountain, wind blows sediments from one side to the other, leaving traces on grains on the rock surfaces, and material is transferred.

On the residential side, people can live in clusters and individual houses. A circular volume is taken from the collective living side to leave a courtyard. On the other side, it becomes the core to support the bridge that allows people to commute.

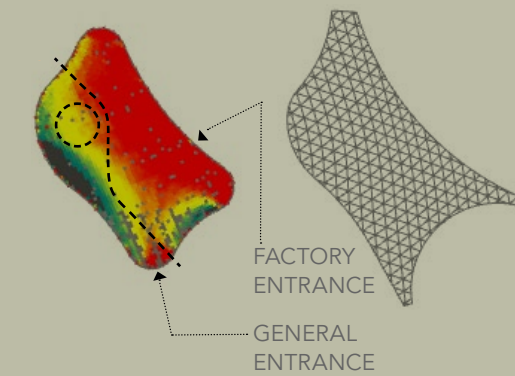


3 THE SHELL



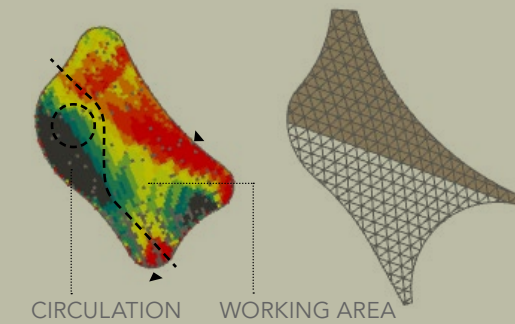
People's journey from the factory side to the relaxation side is first vertically through the core, made from stacked CLT, to the second floor, where there is a mezzanine, and then through the glulam bridge to arrive at the rooftop of the other side, where they can relax and sleep.

General visitors can drive to the idlewild and visit the building on the ground floor. The general path is separated from the manufactory space. A cafe serves both visitors and workers. More private offices occur on the second floor, where people can utilize the mezzanine flexibility as meeting and gathering spaces.



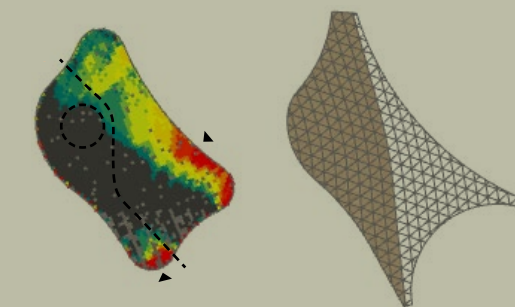
NO SHADING

The north-east side with open factory entrance requires shading from the gridshell's panels.



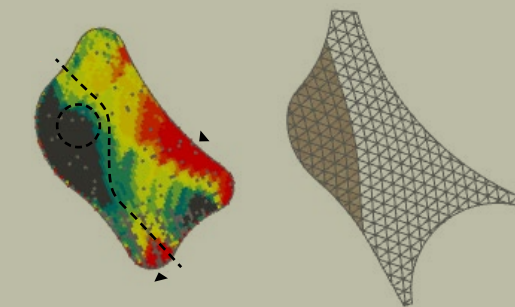
DETERMINE ORIENTATION

First iterations to test orientations of the wood panels vs. glass panels on the grid shell.



DETERMINE PERCENTAGE

Second round of iterations to optimize the percentage of wood panels that would leave the space with sufficient daylight.



FINAL OPTION

Open factory space with moderated direct daylight.

4 THE PRODUCTION

LAMINATED VENEER PRODUCTION LINE

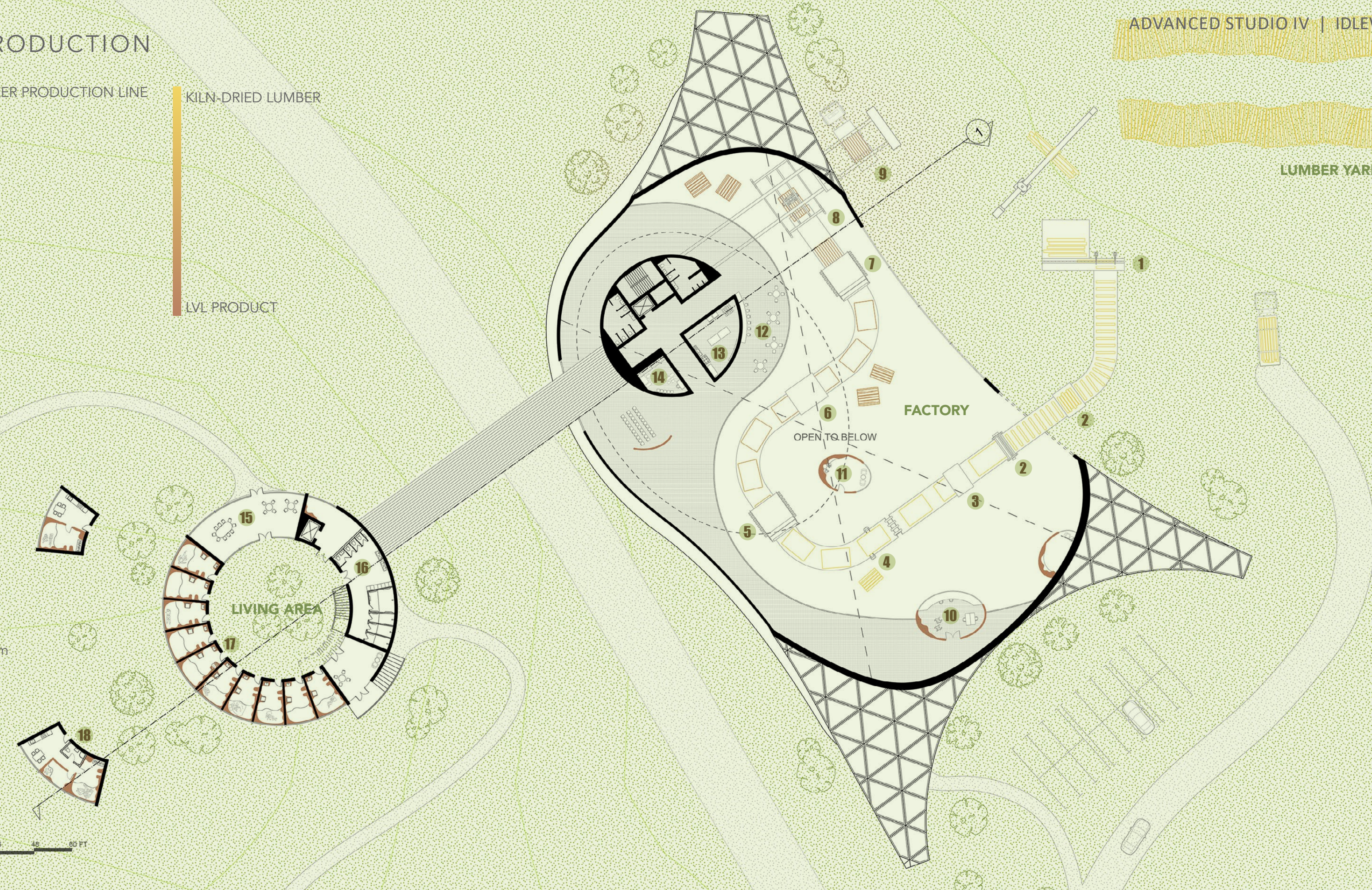
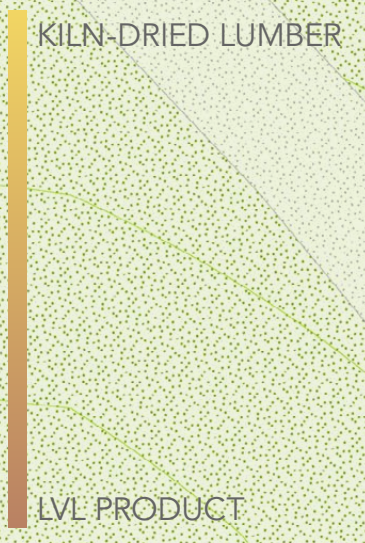
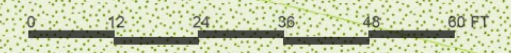
- 1 Log Cutting
- 2 Soaking
- 3 Peeling
- 4 Cross Cutting
- 5 Grading
- 6 Gluing
- 7 Hot Press
- 8 Rip Sawing
- 9 Dispatch

FACTORY

- 10 Control Room
- 11 Relax Room
- 12 Cafe
- 13 Kitchen
- 14 Storage

LIVING AREA

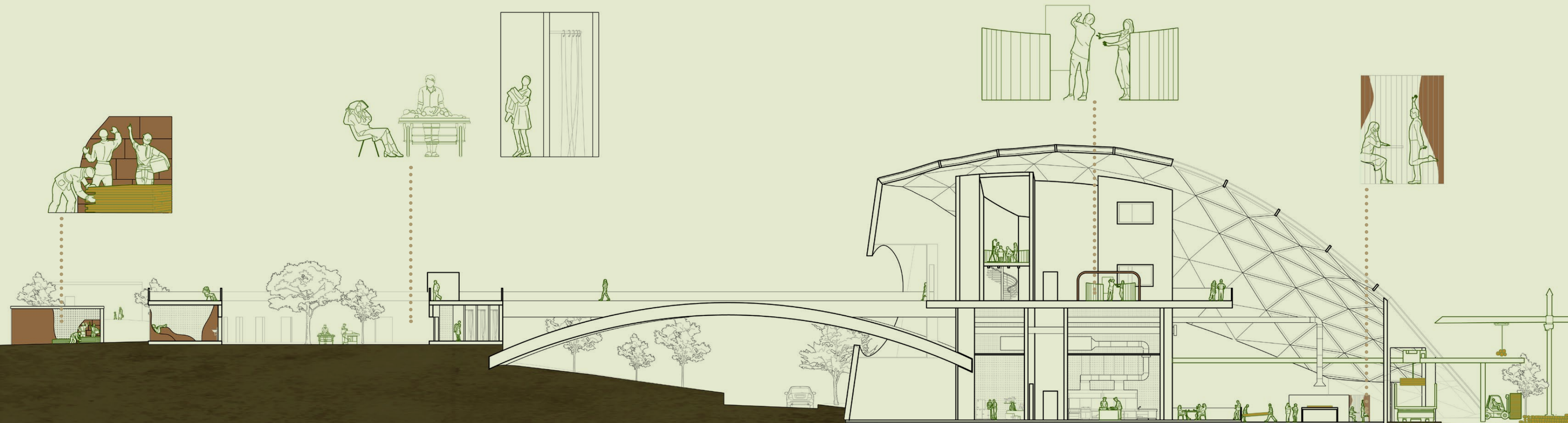
- 15 Lounge
- 16 Shower
- 17 Individual Room
- 18 Larger Unit



5 THE TIMBER

The undulating wall is a man-made mountain surrounding the open factory; the production line constantly flows underneath it with people and timber. The material offcuts of the products can be used as interior walls of the custom resting spaces.

Workers here can be long term or seasonal. The collective living space with shared bathrooms provides spaces for individuals as well as some community lounges. If the workers want to bring a family, they can expand their living spaces to larger units, scattered in the landscape around Idlewild.



At the end of a working day, some workers return to the village, and some would cross to the bridge to stay on site at the sleeping cottages.

At Idlewild, workers can relax at different levels. As a man made landscape, the interior walls are derived from people's postures while they relax.

Different from the LVL production line, where materials are produced by machines, the making of these carved surfaces by workers themselves, using material offcuts, based on their own postures, can be slow, non-standardized, and manual.







The village Cornwall-on-Hudson near black rock forest, in 2019, had a population of less than 3,000 and 96.63% white. Population has been stable in the past 30 years. The factory and residences at Idlewild forms a new workers community and brings a new demographic for the factory as well as the village. At the western bank of the Hudson, where its water meets the Moodna Creek. the new idlewild with its variety of surface and new types of timber products, combines the function of summer houses as healing places with a dangerous and labor-intensive workplace.

CURTAIN WALL BUILDING MANUAL

IN COLLABORATION WITH:
Audrey Dandenault
Myungju Ko
Chi Chi Wakabayashi

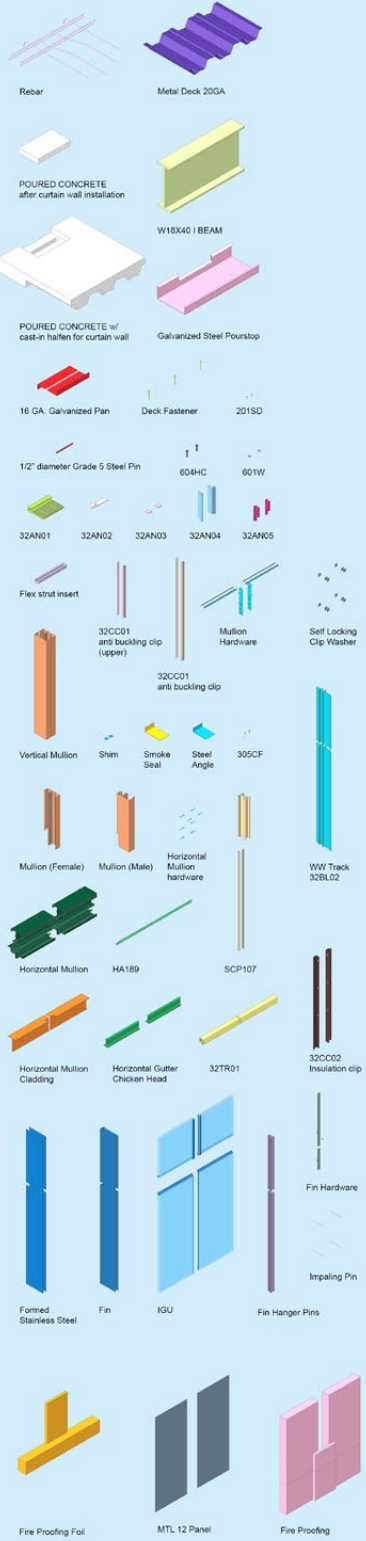
COURE CRITIC: Nicole Dosso
FEB - APR 2022



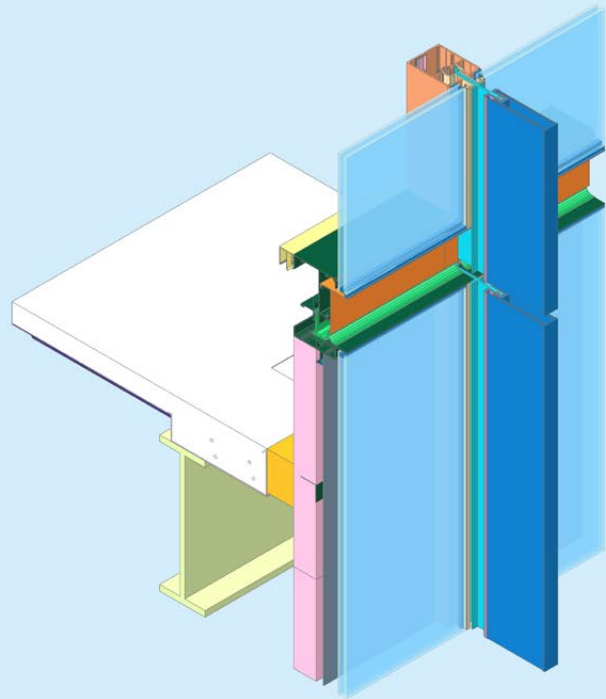


TEAM B1

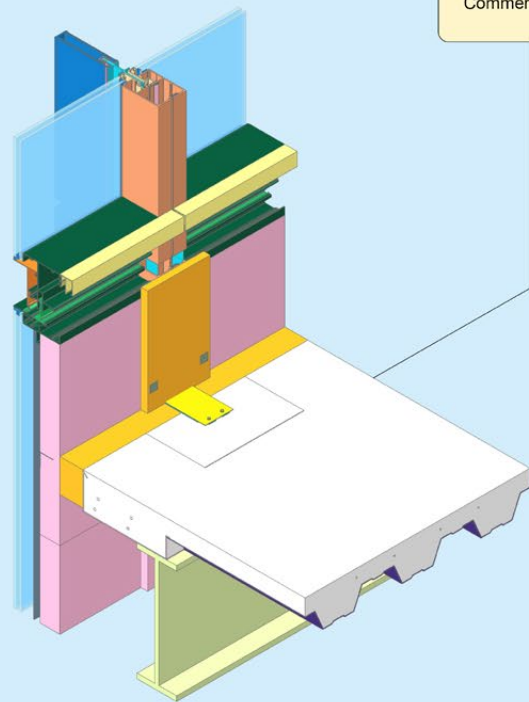
Chi Chi Wakabayashi
Yiyi Gao
Myungju Ko
Audrey Dandenault



1



2

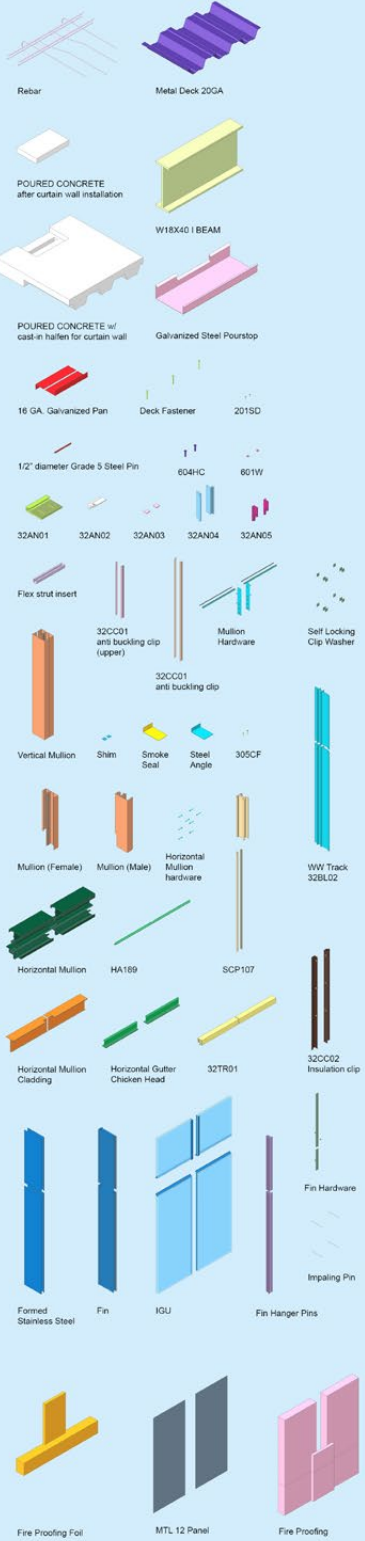


Curtainwall
4 Way Intersection
Commercial

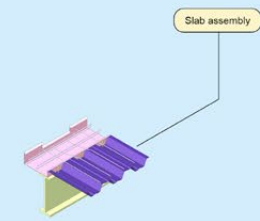


TEAM B1

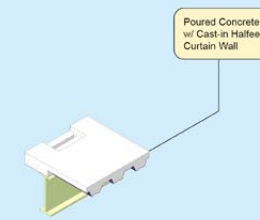
Chi Chi Wakabayashi
Yiyi Gao
Myungju Ko
Audrey Dandenault



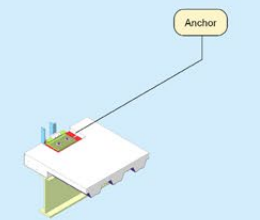
1



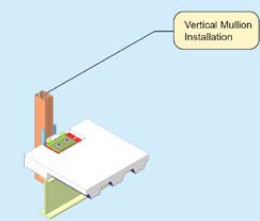
2



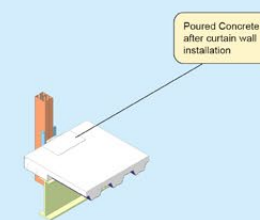
3



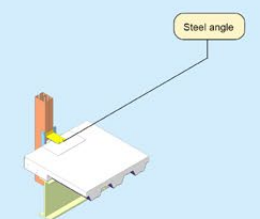
4



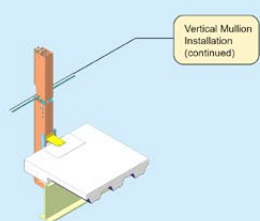
5



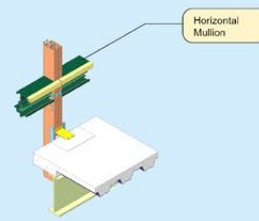
6



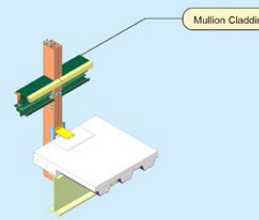
7



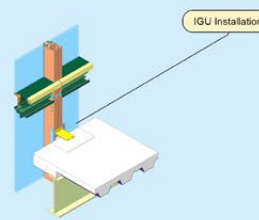
8



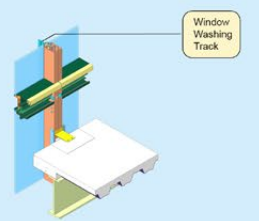
9



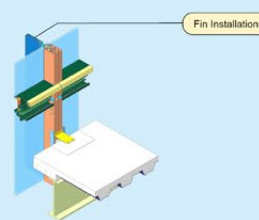
10



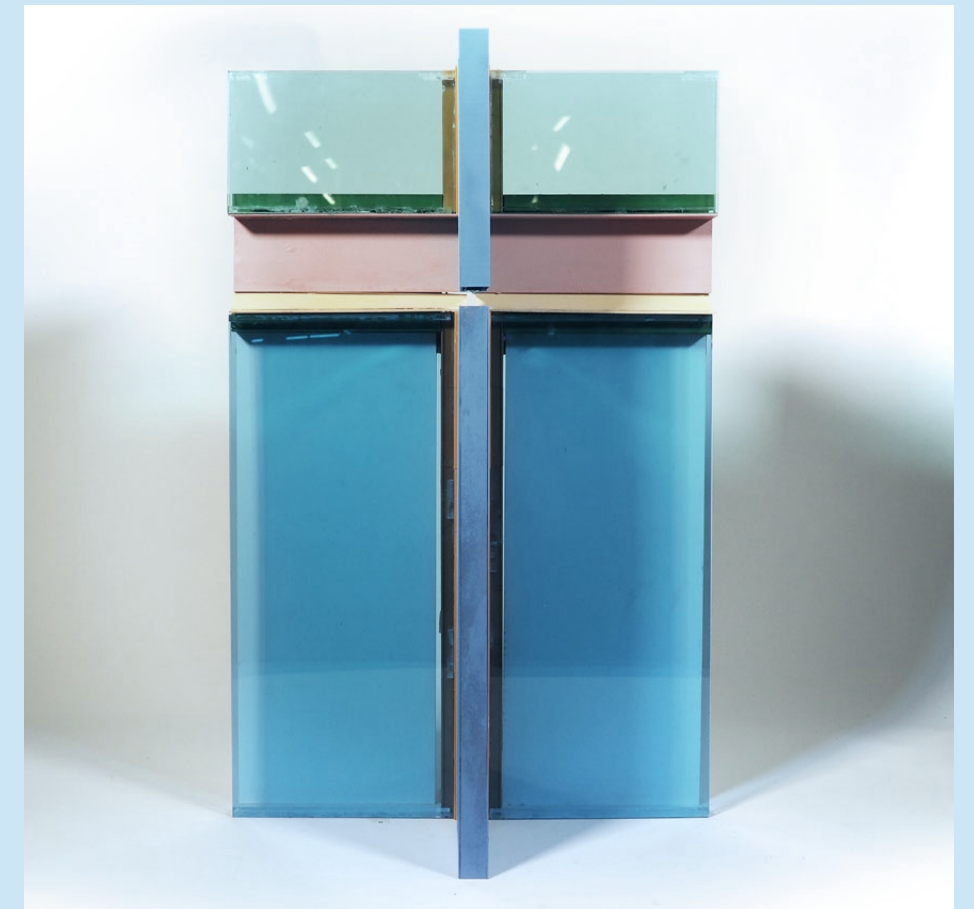
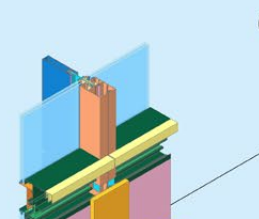
11



12



13



X INFO MODELING ESSENTIAL TRIPS

CUSTOM ANALYSIS TOOLS

COURE CRITIC:

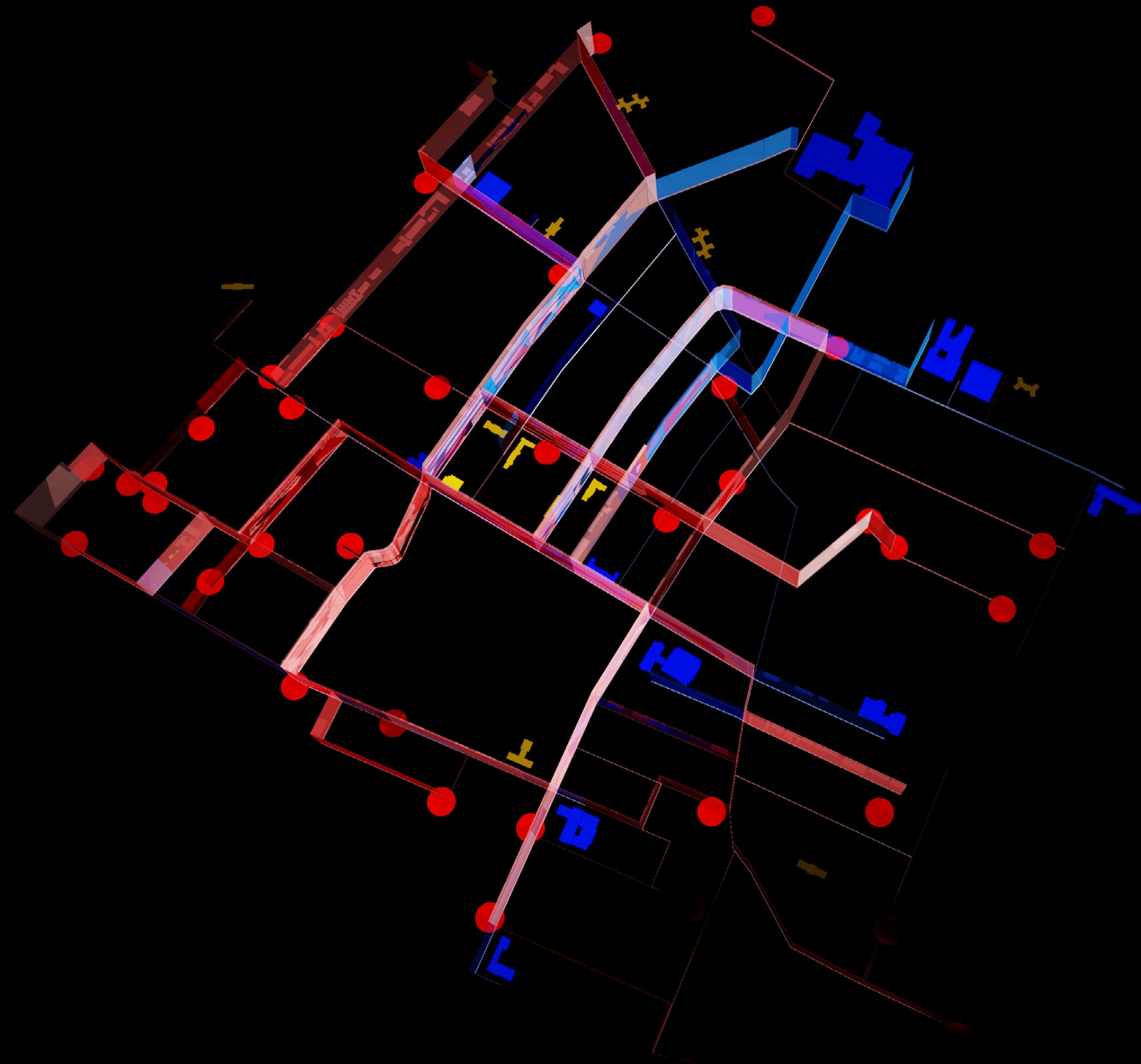
Snoweria Zhang, Luc Wilson

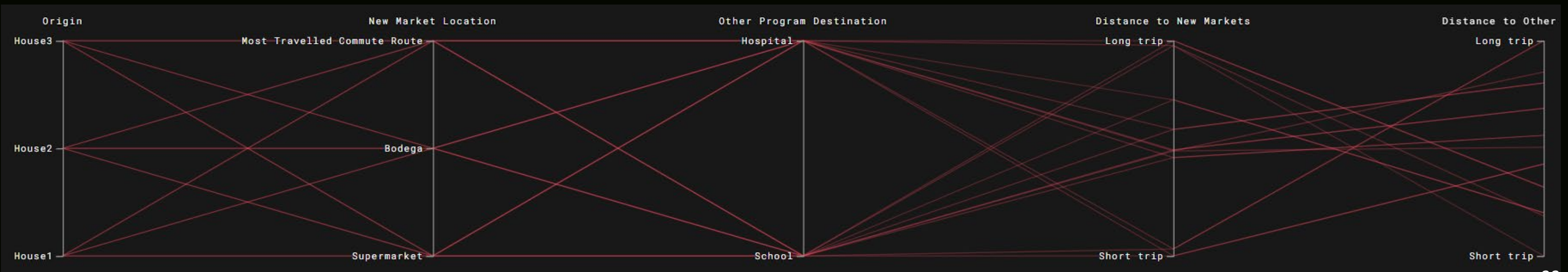
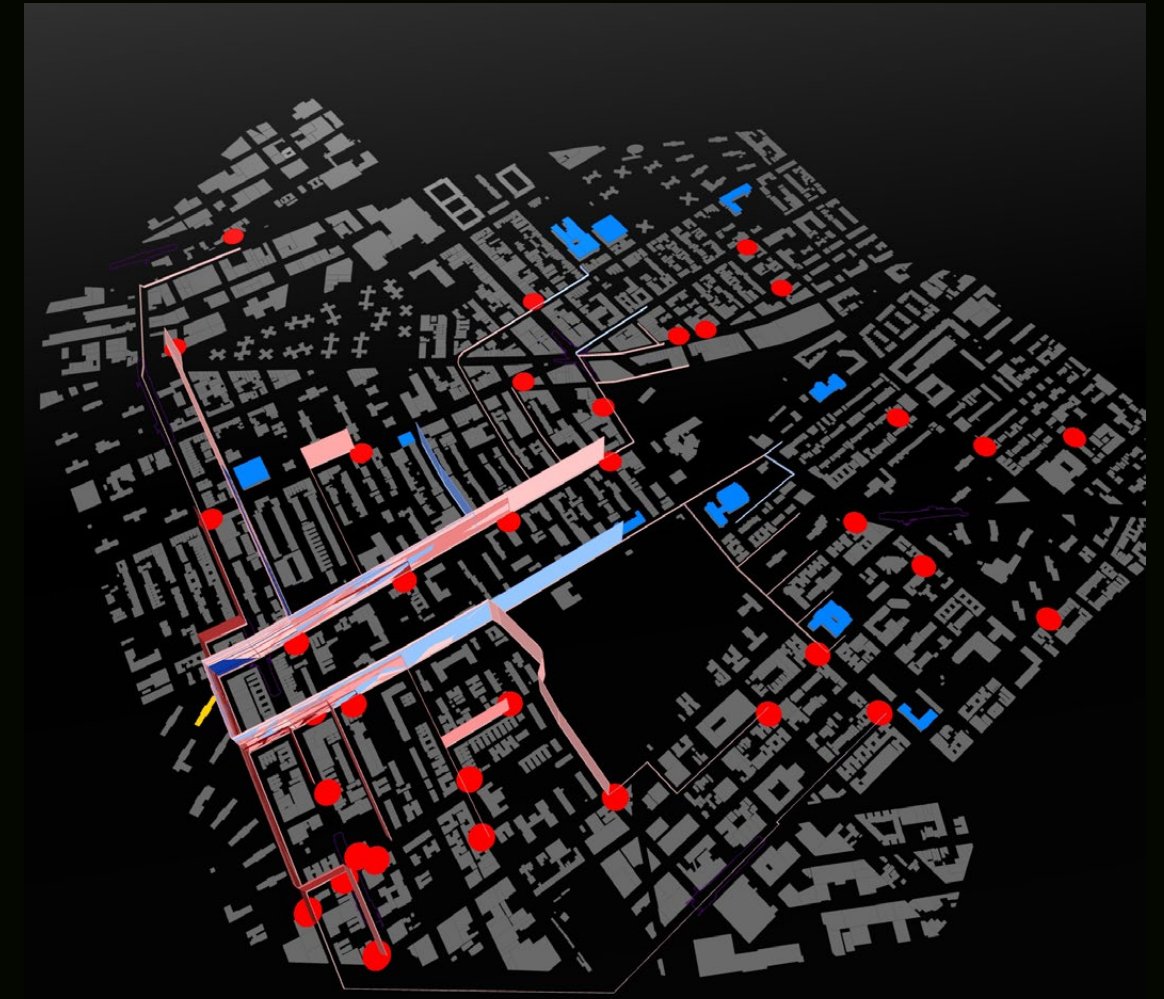
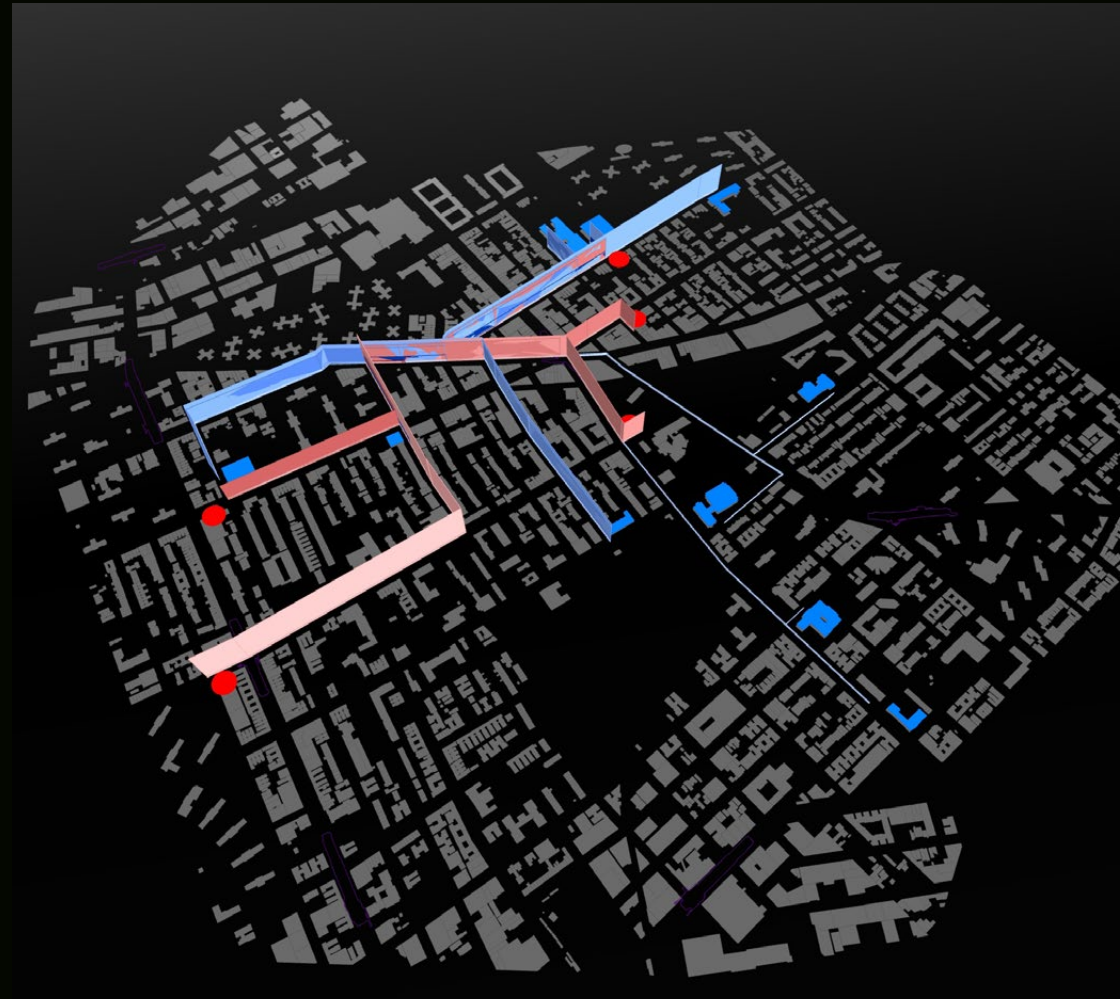
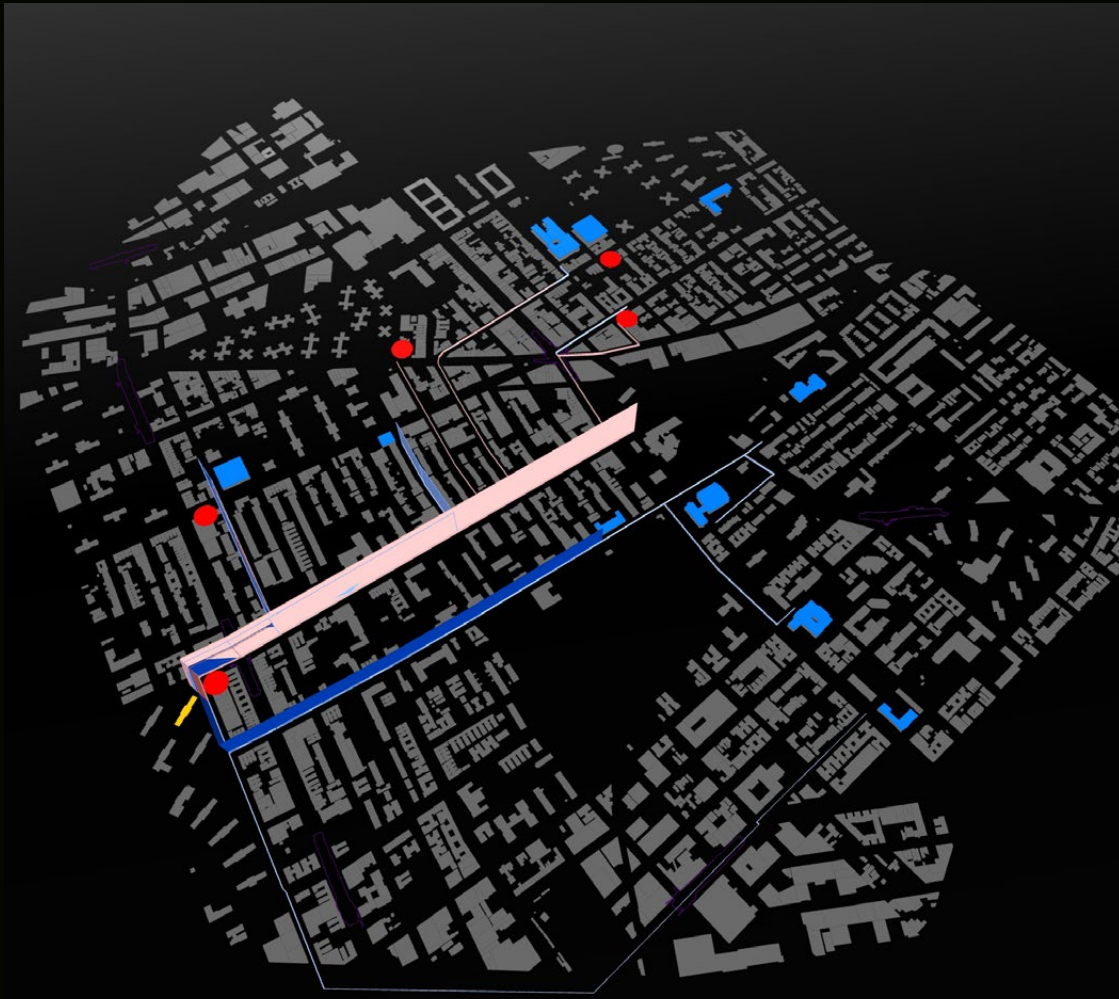
FEB - APR 2022

Expanded outdoor dining from restaurants to the streets during the pandemic has highlighted opportunities to rethink the use of sidewalks and streets to accommodate daily goods and services.

Introducing street markets in a neighborhood with limited access to fresh food would decrease the travel distance from households to fresh produce, but how would this new program impact the access to other essential services?

This analysis tool evaluates how adding a new program space (e.g., fresh produce market space) to a neighborhood impacts other programs' users (e.g. hospitals and schools).





THE WORD FOR WORLD IS FOREST

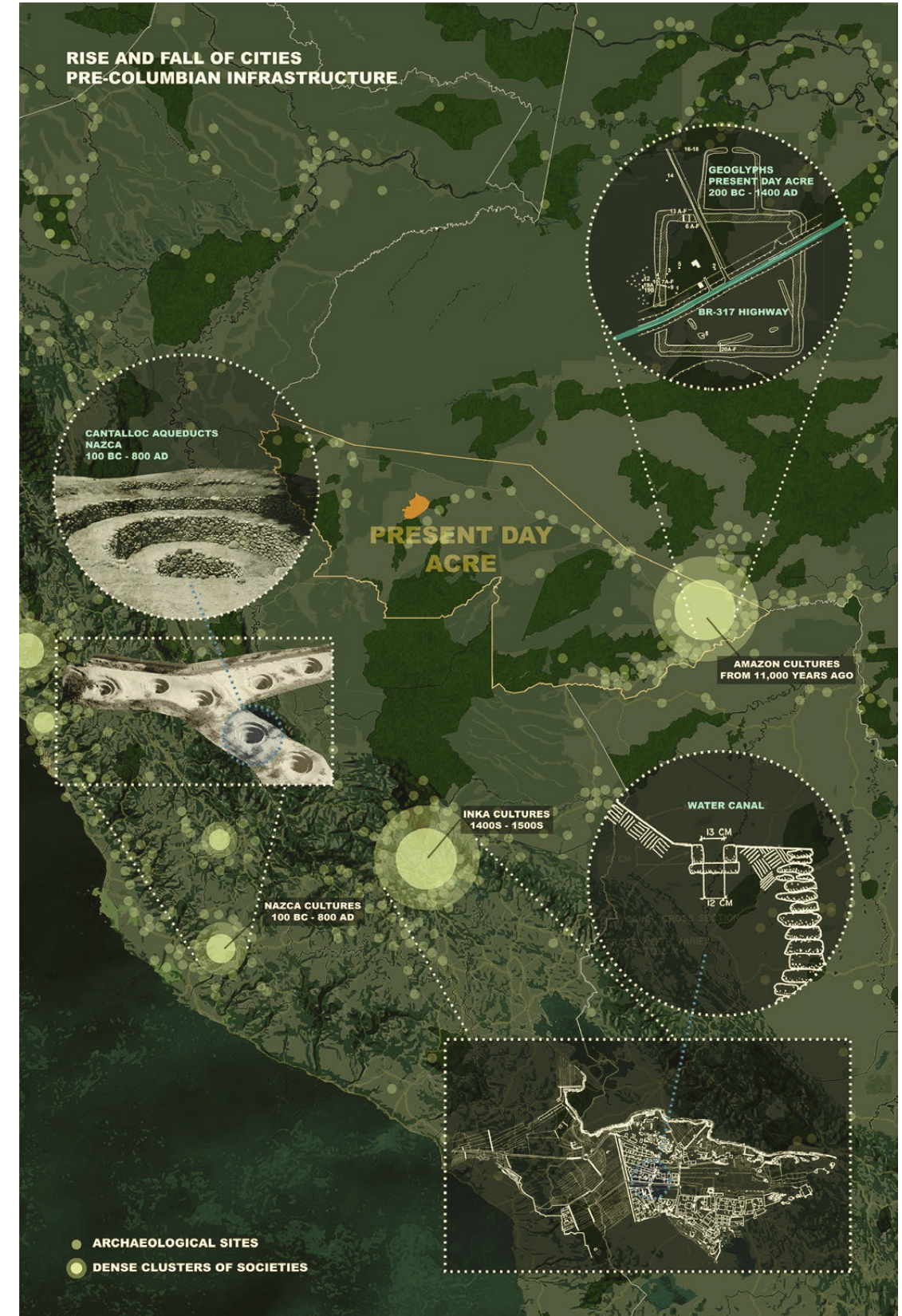
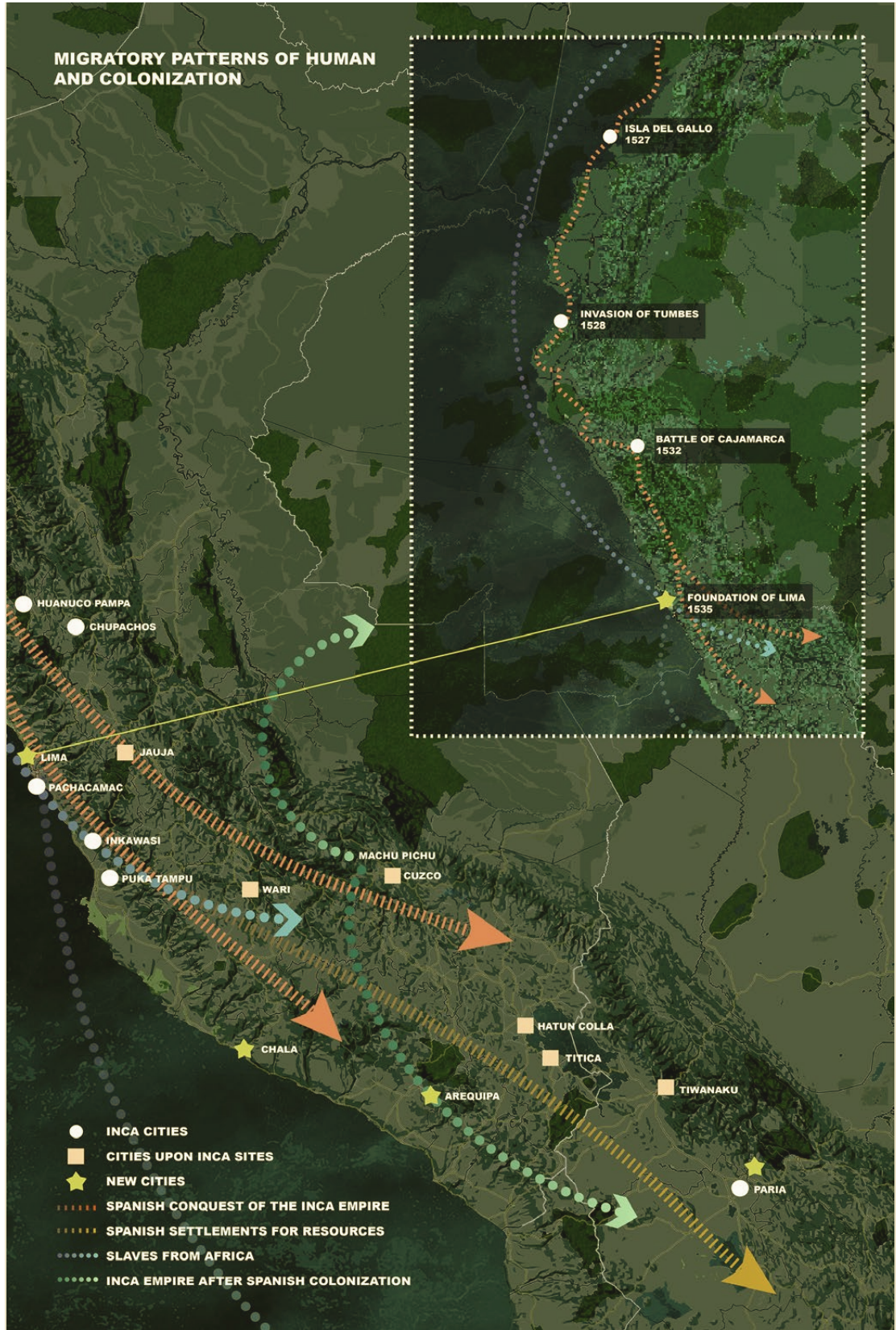
INDIGENOUS FUTURISM
STUDIO CRITIC: Vanessa Keith
SEP - DEC 2022

Forces of colonization and urban development have been eroding evidence of pre-Columbian management of the Amazon landscape. They have been taking away the authority of the Amazon rainforest from the hands of the indigenous people. Flooding and deforestation resulting from illegal logging and construction pose a looming challenge for the Shukuvena Village, one of 12 reconstructed Yawanawá villages in the Brazilian Amazon. Designing for a distant future in 2180 opens an opportunity to revive the pre-Columbian ways of living with the forest.

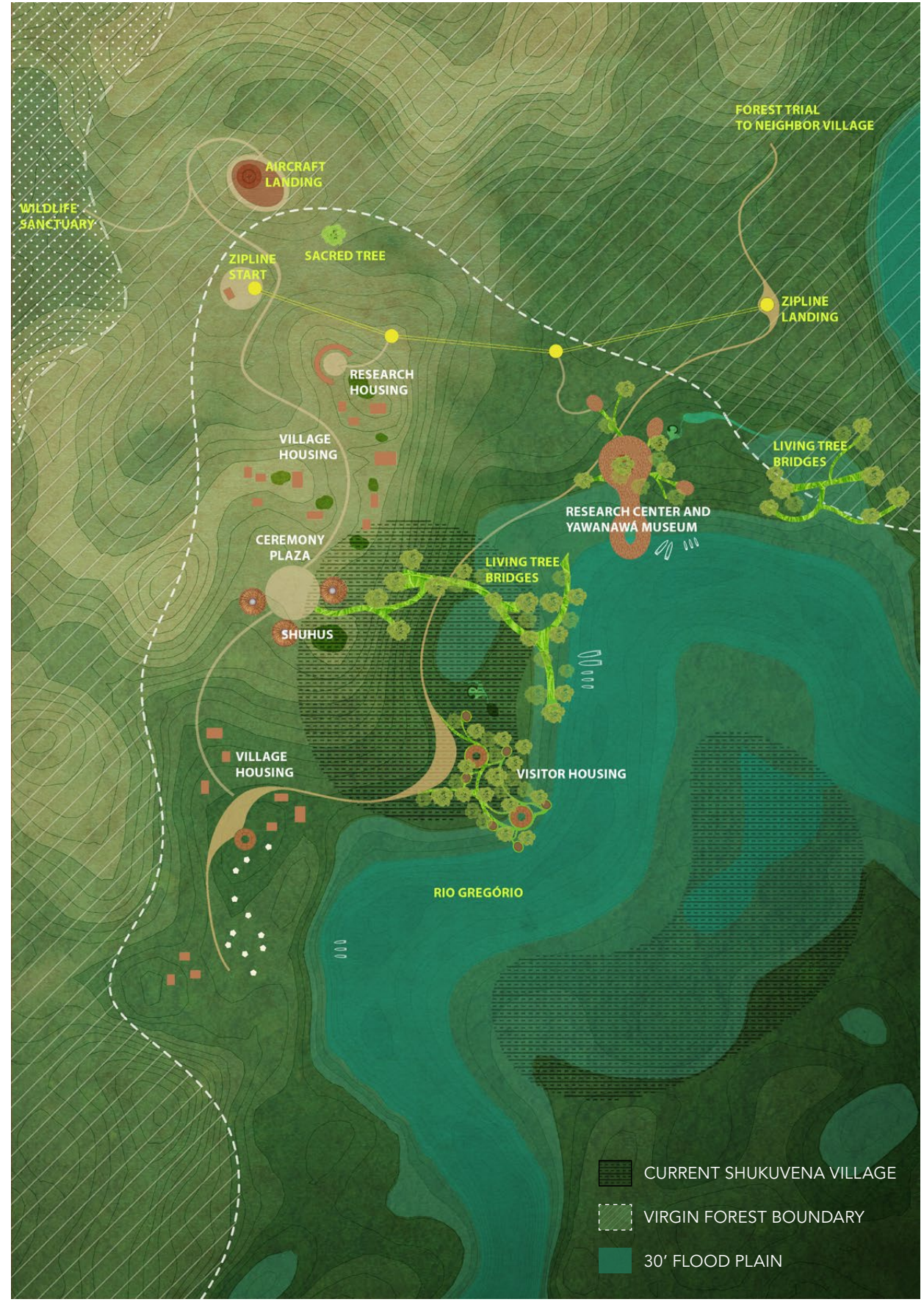
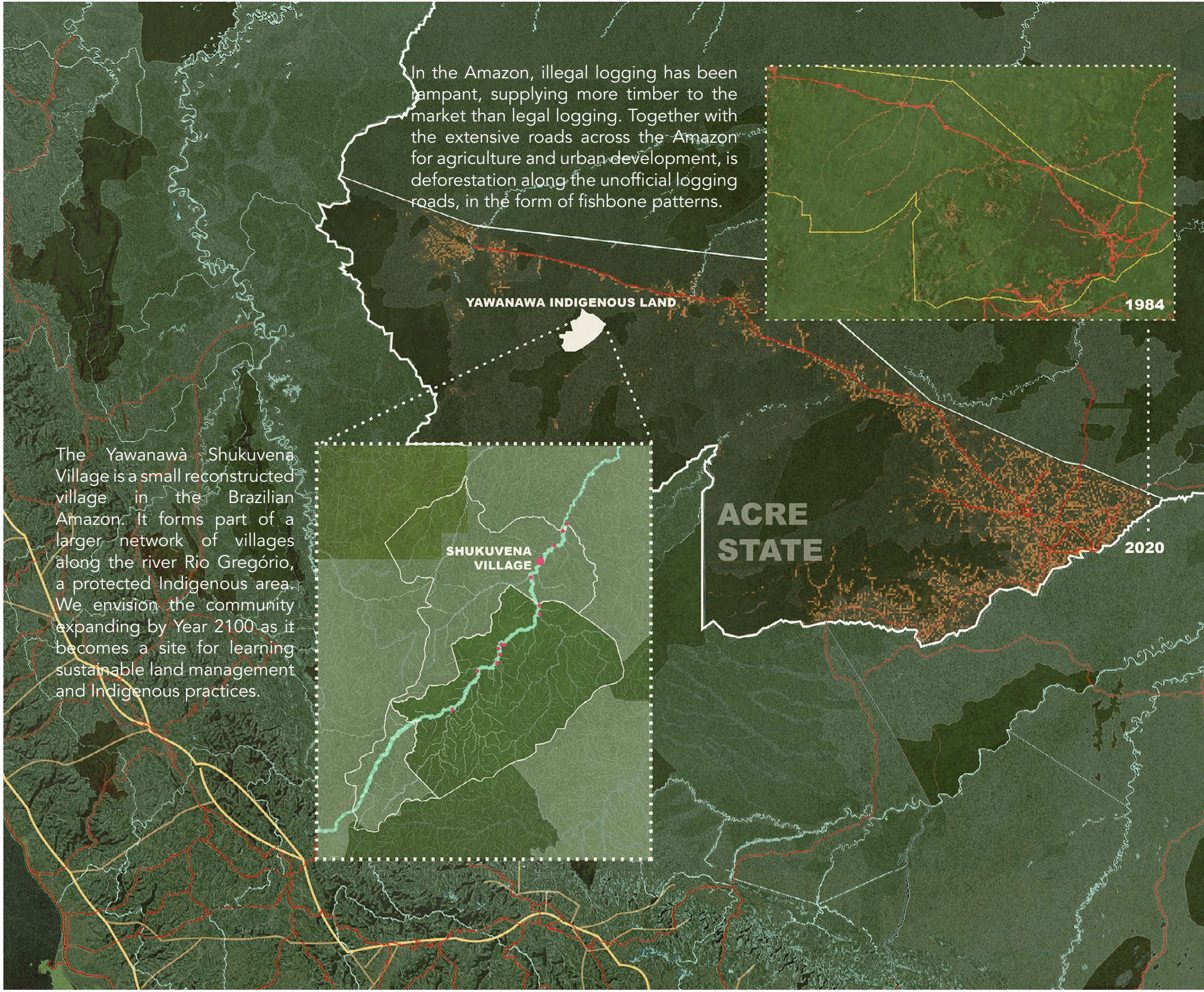
Instead of cutting down trees to make way for roads that further fragment the forest, trees can be used to be part of the infrastructure. In the 2180 Shukuvena village, aerial roots of rubber fig trees will be trained to form continuously growing living bridges, combined with a series of sustainable, small-scale climate mitigation devices from aquaponics to algae power generation to create an interconnected infrastructure. It is a new type of rainforest landscape to be entirely constructed by the local community and function in symbiosis with the natural environment.



1 PRE-COLUMBIAN LANDSCAPE



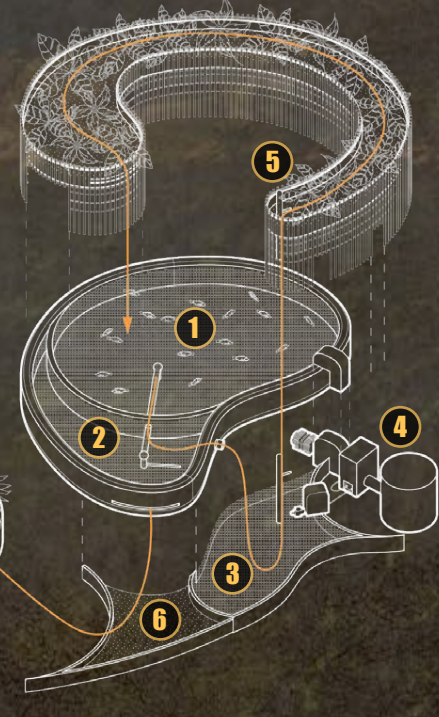
2 DEFORESTATION



3 CLIMATE DEVICE

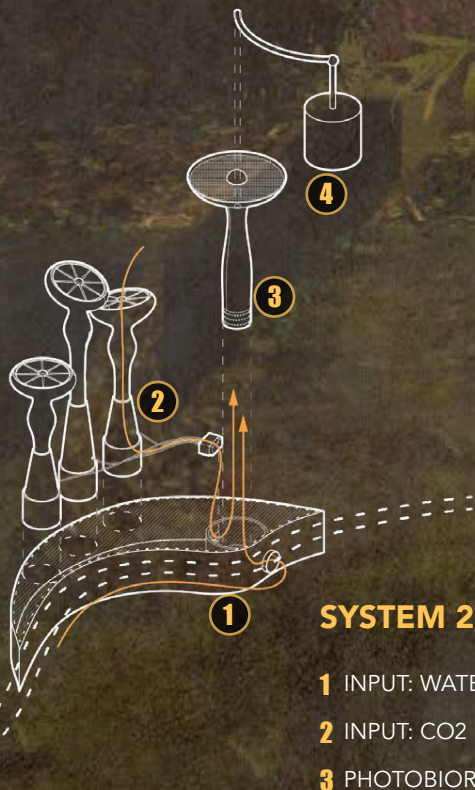
SYSTEM1 : AQUAPONICS

- 1 FISH TANK
- 2 SOLID LIFTING TANK
- 3 SUMP TANK AND BIOFILTER
- 4 WATER PUMP
- 5 GROWING BED



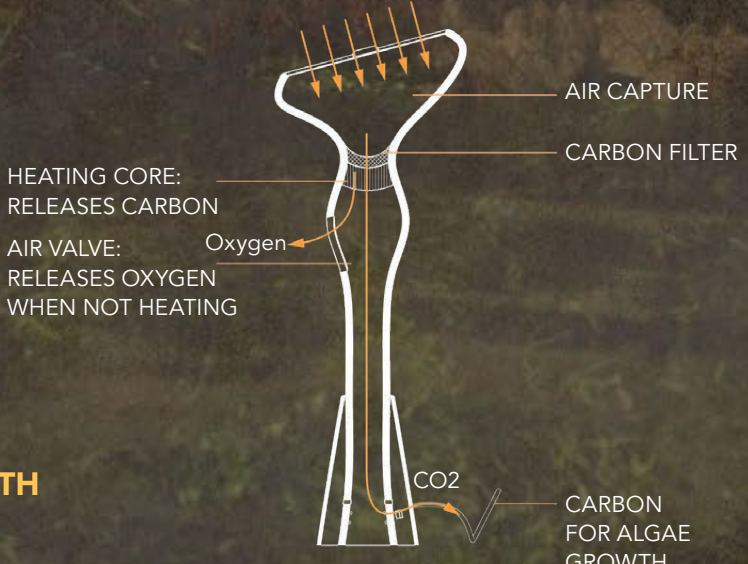
SYSTEM 1: FERTILIZER

- 5 FISH WASTE TANK
- 6 GARDEN

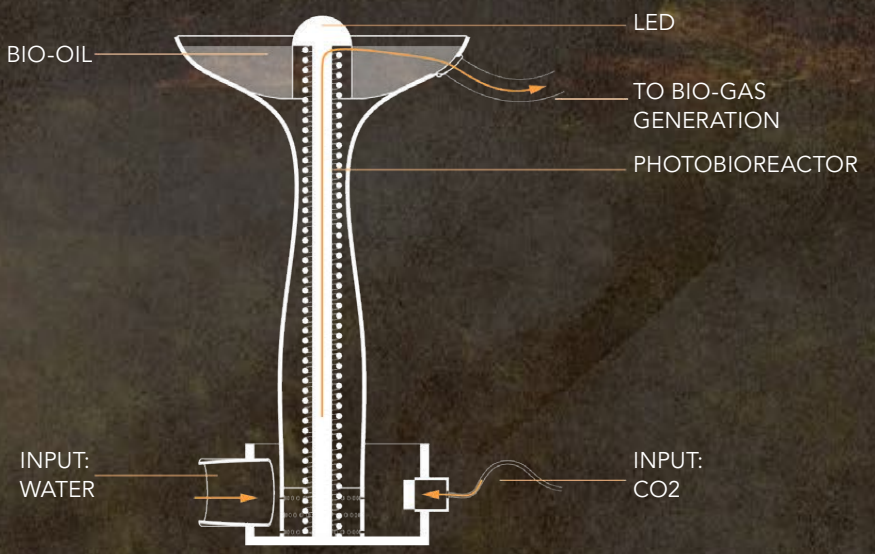


SYSTEM 2 : ALGAE GROWTH

- 1 INPUT: WATER
- 2 INPUT: CO2
- 3 PHOTOBIOREACTOR
- 4 BIO-GAS



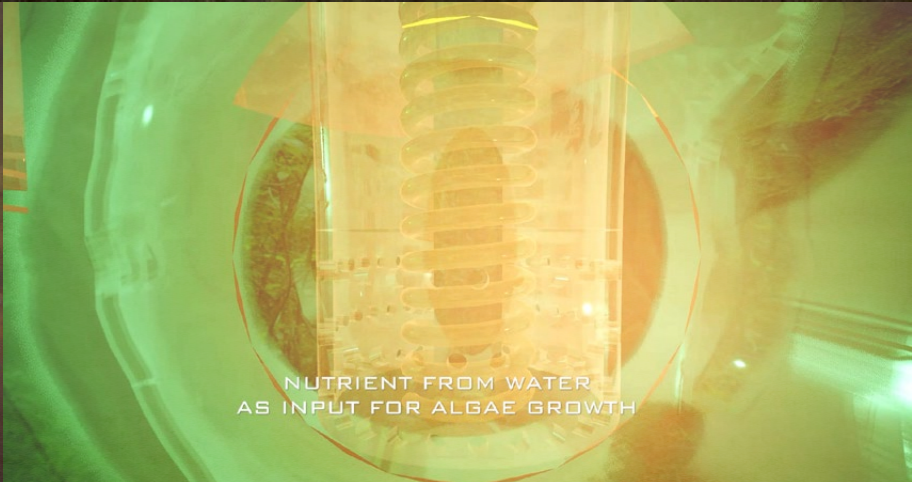
CARBON CAPTURE



ALGAE GROWTH AND POWER GENERATION



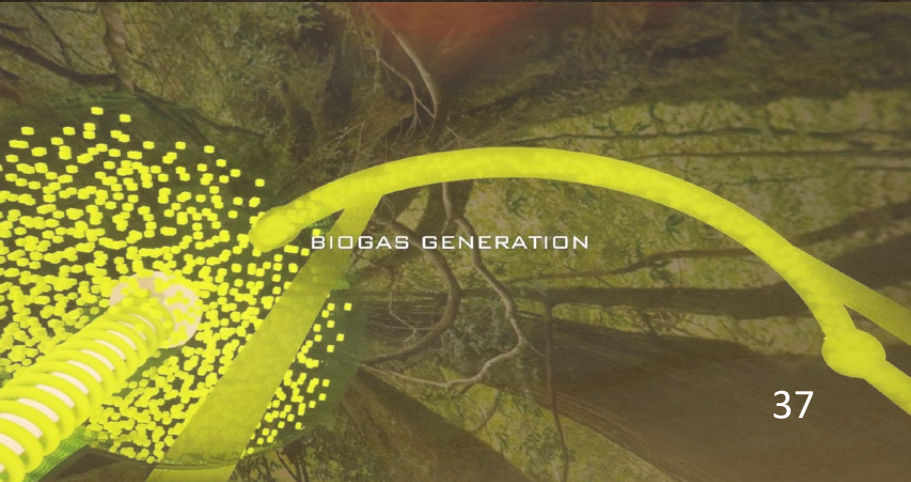
AQUAPONICS SYSTEM FISH POND



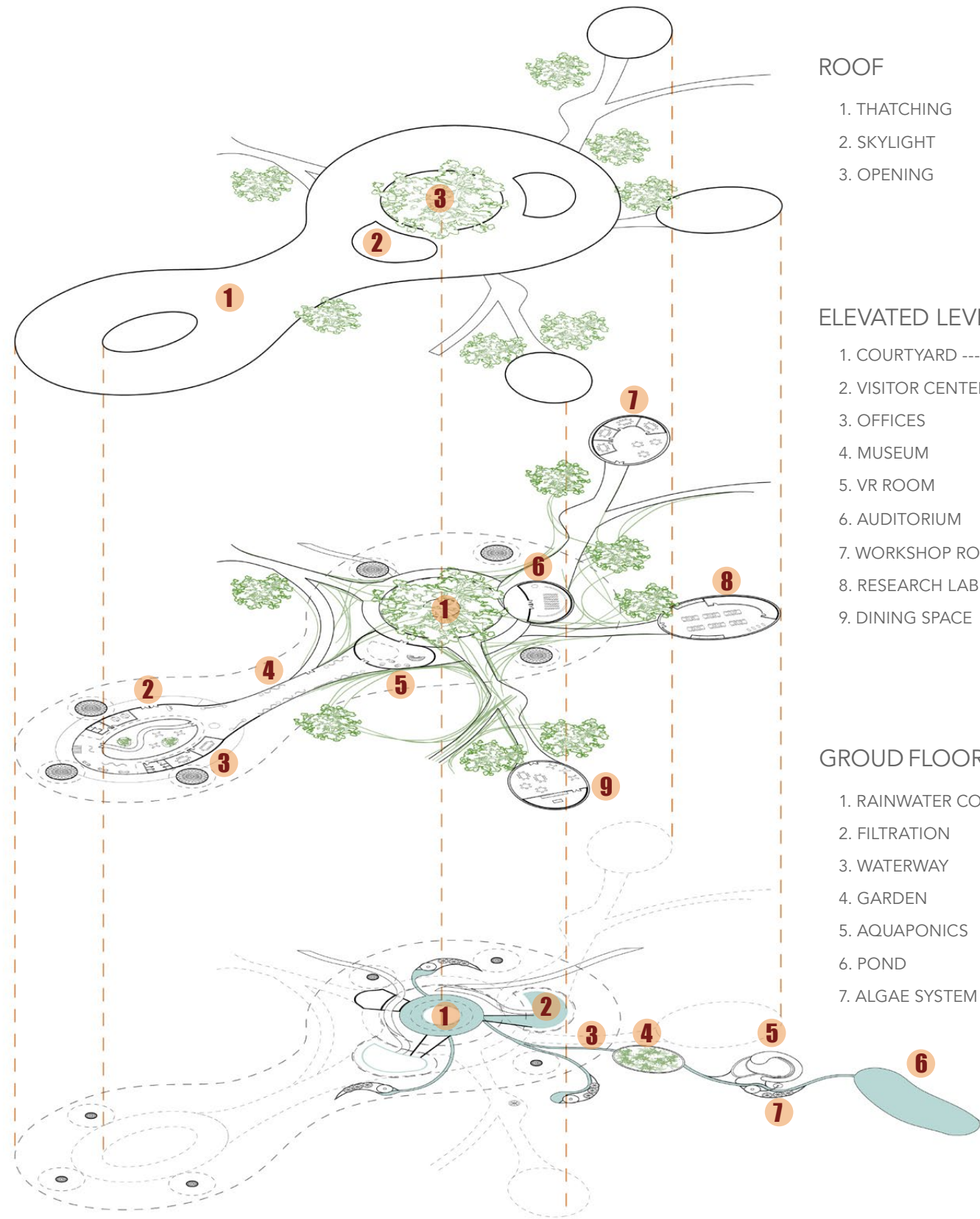
NUTRIENT FROM WATER AS INPUT FOR ALGAE GROWTH



AIR COLLECTION FOR CAPTURING CARBON



BIOGAS GENERATION



The center of the building is a hub where all bridges lead to, it is a courtyard where performances and ceremonies are held. Below it, a system collects and filters rainwater, it is a water hub connects by waterways to the climate devices.



Planings are made a decade in advance. First, individual programs are constructed. Aerial roots of rubber fig trees keep attaching to the bamboo primary structure of the bridges, forming a strong woven network with all natural materials. In over 30 years of time span, the tree roots interweave with the buildings into an integrated structure.



[LINK TO FULL VIDEO](#)



INFINITY ROOM

VIRTUAL GAME

IN COLLABORATION WITH:

Maxine Gao

Luis Salinas

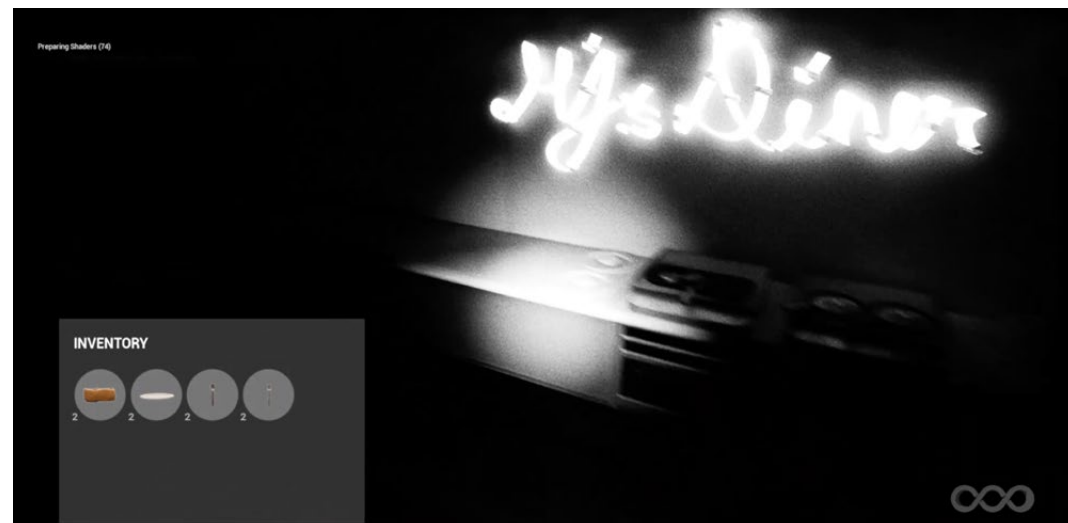
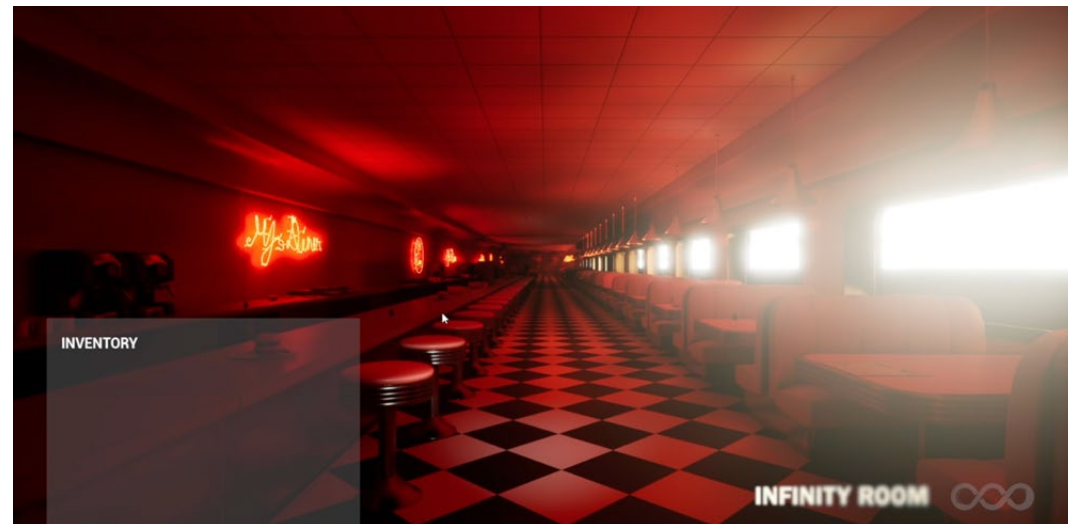
COURSE CRITIC: Nitzan Bartov

FEB - APR 2023

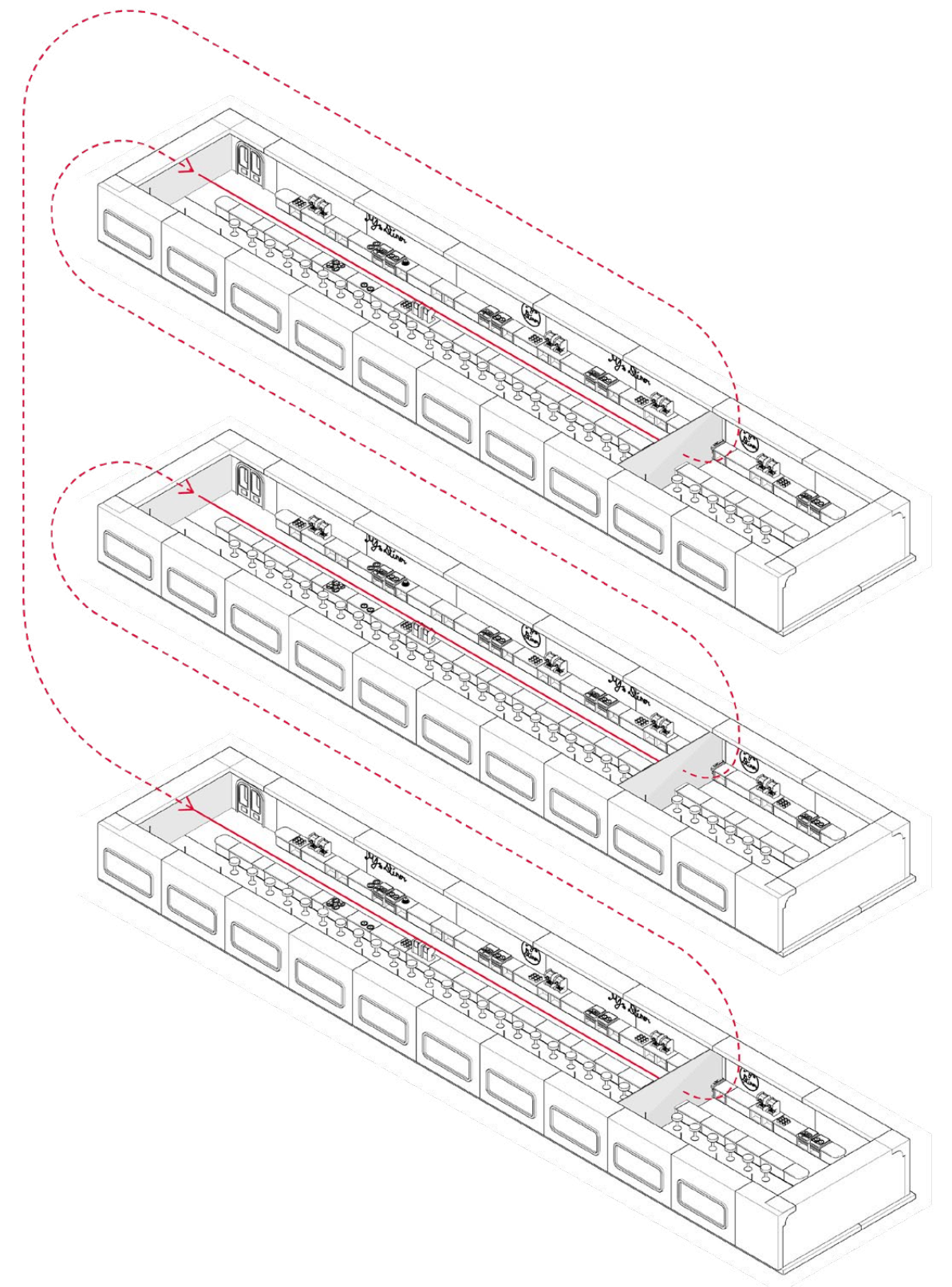
You find yourself sitting in an empty diner
you are surrounded by mundane objects
You began exploring the space with intuition
Try interacting with different objects
You pass a mirror
Are you back to where you started
The space is bizarre
Are you trapped here
How are you
How do you escape



1 LEVEL, ACTOR, INTERACTION



2 PLAY, LOOP



POSTSPORTSPLATZ REIMAGINED

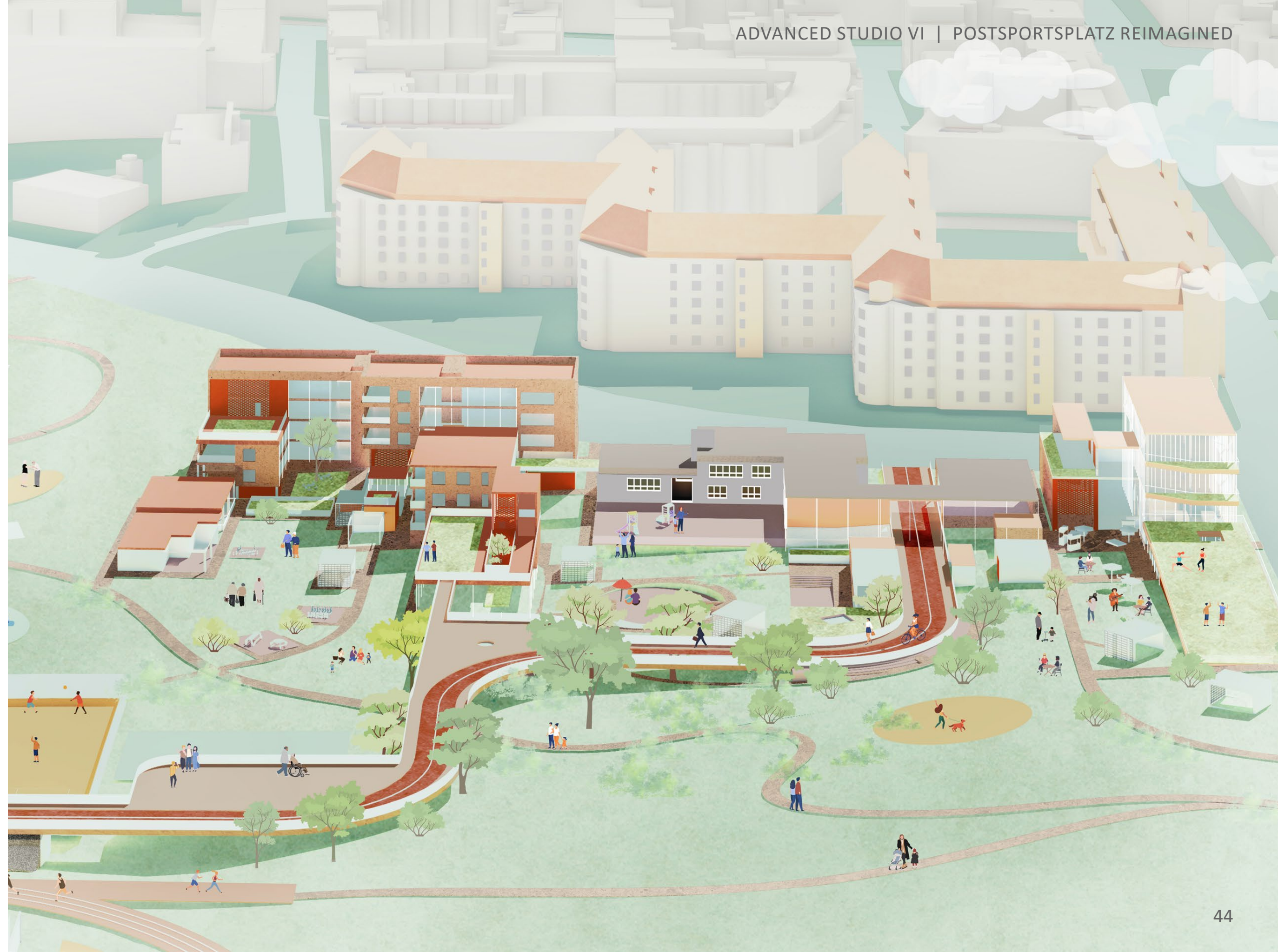
URBAN DESIGN
IN COLLABORATION WITH:
Candice Ji
Polina Stepanova
Yang Fei

ARCHITECTURAL DESIGN:
Individual Work

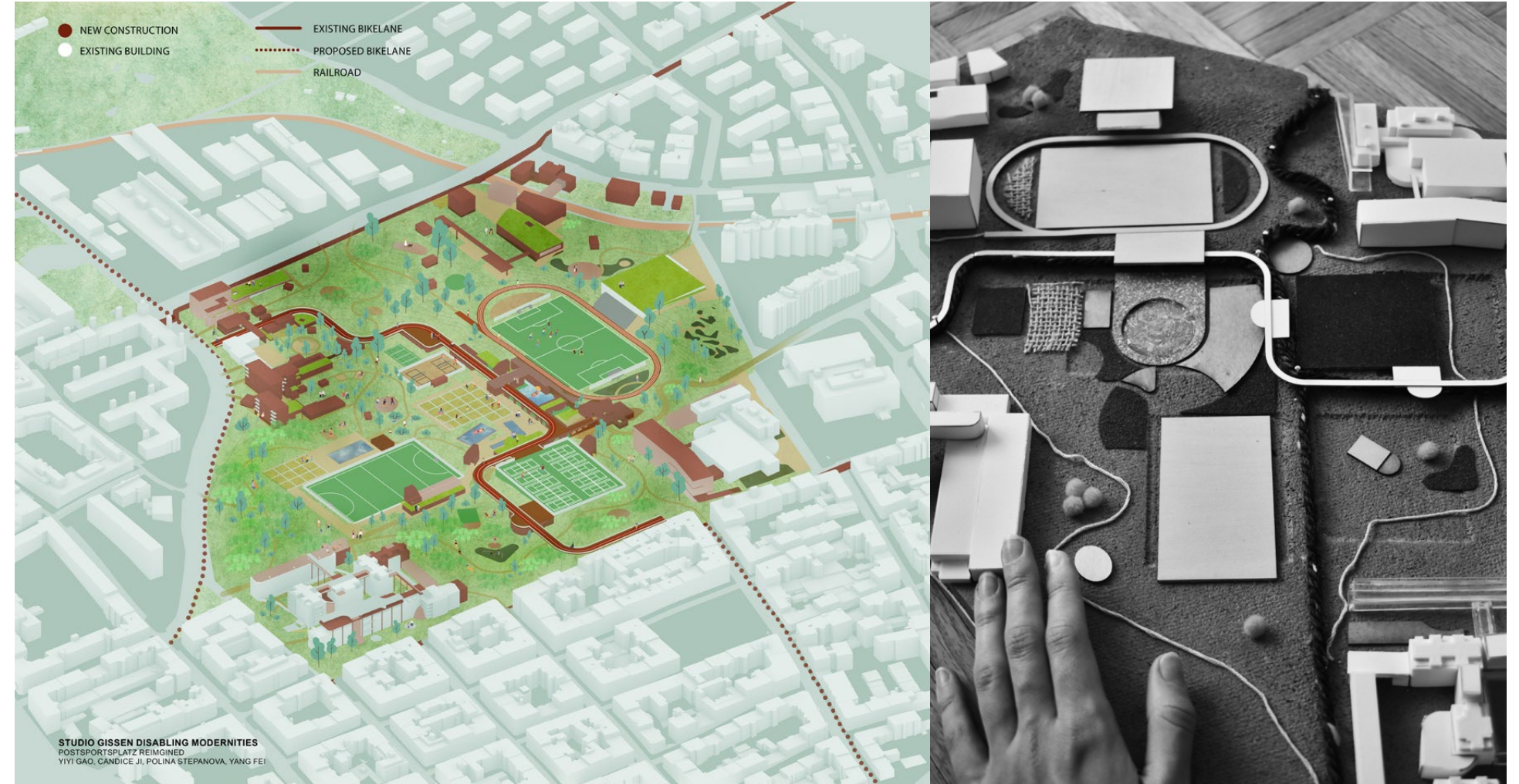
STUDIO CRITIC: David Gissen
FEB - APR 2023

PostSports was founded in the 1910s as a sports club for employees of the Austrian "Post and Telegraph Employees." The Club quickly grew in popularity, expanded in the 70s, and moved to its current location in the 17th Hernalds district of Vienna. Today, PostSportsplatz continues to serve as a modern sport and fitness center for the community in Vienna and beyond.

While the site is located at the heart of a local neighborhood where different uses come together, the current usage of the site does not reflect this effect. It is currently dominated by single-use, high-impact sports, including tennis, running track, and hockey. There is an opportunity to redesign PostSportsplatz for broader groups of audiences and multigenerational use.



1 INTEGRATION, INCLUSIVITY, VERSATILITY



The redesign of Postsportsplatz fits into the overall citywide strategy: improve quality of Life as a goal and increase walkability and cyclability in the face of heat challenges. The team presented the proposal at Vienna city hall, which agreed with the challenges identified from the site analysis. They recommended the team continue to pursue the idea of openness and increase accessibility.

For urban design, the team focused on integration, inclusivity, and versatility.

Integration:

How to integrate form and circulation on the urban scale into the existing city fabric?

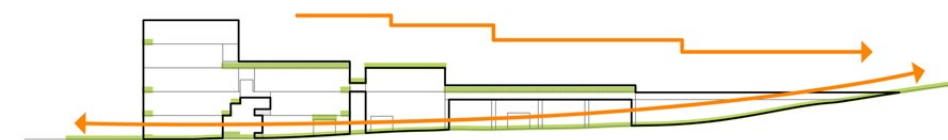
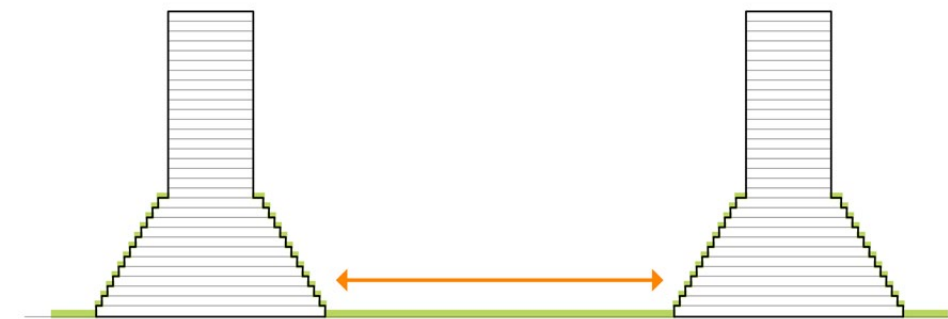
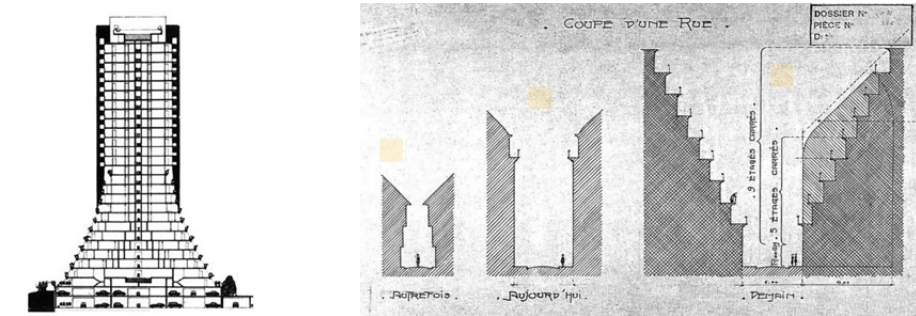
Inclusivity:

How can the mixed-used new sports park cater to people of all ages, generations, and abilities?

Versatility:

How can each space be activated and used during different seasons and times of the day?

2 THE HOUSING MOUNTAIN

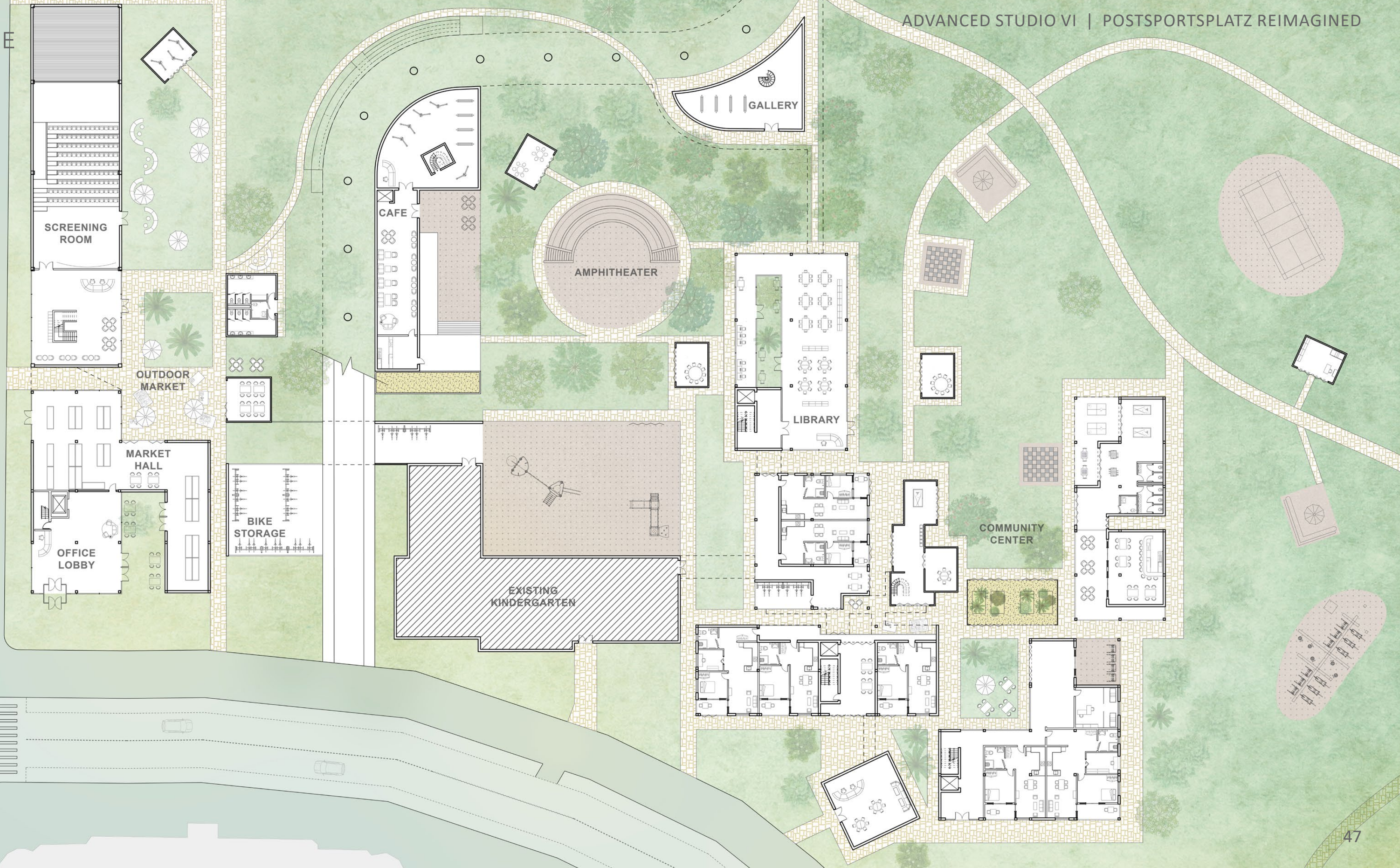


Alterlaa designed is a social-housing project in Vienna. The housing mountain is a mismatch from surrounding city fabric with megastructure highrise and enclosed community facilities.

To disable the modern terrace housing features, and to envision a new type of terrace on the post sports park welcoming public access, the first step is to find ways of fragmenting the housing mountain.

Modern terraced housing movements maximize daylight for the private balconies; but how can the new terraced fragments provide "dark" spaces. The dark space is an reassessment of the Medieval alleys, with narrow pathways like cracks in the city. These cracked become a way of fragmenting the housing mountain.

3 THE USE



4 TEH FRAGMENTS



COMMERCIAL, MARKET, AND ROOFTOP GREEN



KINDERGARTEN, COMMUTER PATH, AND BIKE STORAGE



SENIOR HOUSING, CHESS PLAZA, AND LEARNING CENTER



Instead of a housing complex that required privacy and controlled entrance, a variety of programs are introduced for both residential use and public use into this new development.

New senior housing change the site from a high impact sports club to encouraging multi general use, The courtyards from the residential side fragments from housing into a variety of community spaces and connect to the sports park facilities.

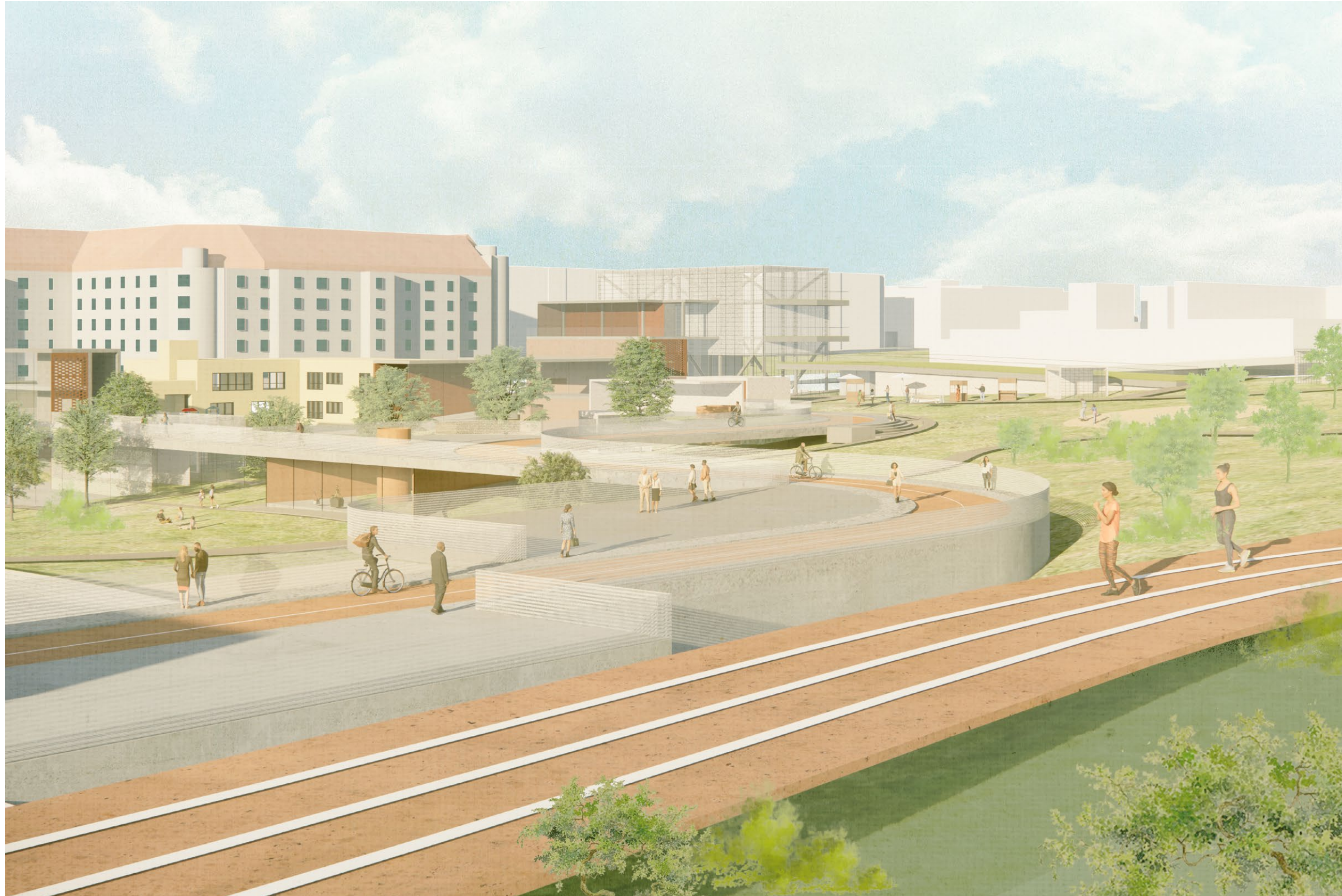
The alleys between buildings are intimate and shaded spaces. Some of the ground floors are open while others are indoor and can be used all year round. It becomes a vibrant place where people can exercise, read, eat, drink, chat, and do all kinds of activities.

6 THE COURTYARD



To add a variety of activities on site and reduce the dominance of professional sports, the smaller pavilions scattered on the courtyard can be used by both the residents and other users of the post sports as multi-purpose spaces not designated to sports.

The building fragments are scattered on a terracing site and connected in different ways. Some spaces like the library and bike storage are connected to the elevated pedestrian and bike bridge, which at some points are also accessible from the ground by ramps and stairs. The ground are permeable with narrow alley.



From the street, the mirrored terrace corner filled the previous open gap between the dense and tall residential district and the open ground. The new corner starts with multi-storey buildings, and gradually dissolves into smaller fragments that are integrated with the landscape on the sportspark.

The new buildings also form a new type of terrace in relation to nature. From contained balconies inside buildings and green space in between housing mountains to a gradual transition from the street side building to the nature at the sportspark.

As commuters bike through or walk through the elevated pathway across the sportspark, The small pavilions almost disappears behind the trees, the built corner does not take over nature.

FULL PORTFOLIO:
www.yiyigaodesign.com

CONTACT:
yiyi.gao@columbia.edu

